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Dr. HEISTER's

COMPENDIUM

OF

ANATOMY.

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767

A COMPENDIUM OF ANATOMY.

In which all the
PARTS of the HUMAN BODY
Are ſuccinctly and clearly deſcribed;

AND

Their USES explained.

By LAURENCE HEISTER, M. D.

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Tranſlated from the laſt Edition of the original Latin: Greatly augmented and improved by the Author.

To which are Added,

NOTES by M. Henault, and the Editor.

Illuſtrated with Eight large Copper Plates.

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THE PREFACE OF THE TRANSLATOR.

THE great utility of an accurate and perfect Compendium of Anatomy, cannot but be allowed by every one who has at all thought upon that ſubject; and the reception which this in particular has met with, for ſo many years, ſeems to evince, that it has been regarded as approaching very nearly to that character.

racter. The author, who has lived to ſee ſeveral editions of it, has liberally added the fruits of his ſucceeding obſervations to each of them; and, wherever there has ſeemed a deficiency, the tranſlator has attempted, on the ſame plan on which himſelf had proceeded, to ſupply it. The author profeſſes to have ſearched into the anatomical books publiſhed in the intermediate time between his ſeveral editions, and to have collected from each of them their principal diſcoveries, with which he has improved the laſt edition of this work: what books of credit have appeared in this ſcience ſince his laſt edition, have been examined with this intent, the very late one of Verdier not excepted; and ſome things, of no little conſequence, added from it. Senac's animadverſions have been carefully examined alſo, and ſeveral additions made from them; which Dr. Heiſter, though he had met with that work, without knowing its author, had omitted: nor has his other and more valuable method of addition to his own obſervations been neglected, where difficulties, undetermined by him, have been hitherto left as *deſiderata*. In this caſe, inſpection into the parts themſelves, with the help of microſcopes, and the aſſiſtance of the preparations of ſome of our moſt eminent anatomiſts, ſuperior to thoſe of any former ones, have been the means of attempting farther certainty. Where, with theſe helps, the diſcovery has been clearly made out, it is added; where ever but the leaſt doubt remained, every thing is left as it was.

Whatever is done of this kind is added in the notes. The author's text is every where preſerved ſacred: and his notes, which are printed ſeparately at the end of this work, make a great part of the comment on the whole.

The pains this Compendium has coſt its author, may be ſeen in the accuracy with which he has finiſhed it, eſpecially in the latter impreſſions; and the difficulties that attended the executing it, are obvious. It was of conſequence to the extenſive character of Dr. Heiſter to convince the world, that it was not a trivial thing he was publiſhing: he is, therefore, to be excuſed for having taken ſome pains to prove it. The neceſſity of ſuch a work could only be ſhewn, by pointing out the deficiencies of authors, highly eſteemed at the time when he wrote it; and it is in this ſenſe that we are to underſtand his remarking ſo many inſtances of it.

The many editions this work has gone through in the original, ſufficiently ſhew its demand to have aroſe from its general uſefulneſs to all who profeſs this ſcience; and we doubt not but it will be as acceptable and uſeful to all gentlemen of the profeſſion, as his General Syſtem of Surgery has appeared to be, ſince its tranſlation into the Engliſh language.

A COM-

A
COMPENDIUM
OF
ANATOMY.

BOOK I.

CHAP. I.

Of Anatomy in general.

1. ANATOMY is an art which teaches the ſituation, figure, connections, fabrick, actions, and uſes of the ſeveral parts of the body. Anatomy defined.

2. The primary object of anatomy is the human body: the ſecondary ones are, the bodies of other animals. Theſe ſerve for the more accurate diſtinctions of ſeveral parts, and ſupply the defect of human ſubjects: this part of it is called comparative anatomy, or the anatomy of beaſts; ſometimes zootomy*. Its objects.

3. The perſon who is ſkilled in the art of diſſecting human and other bodies, and of clearly

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* See on this ſubject Severinus's Zootomia, Blaſius's Anatome Animalium, Collins's Anatomy, the diſſections of various animals by the academy of Paris, and Valentini's Amphitheatrum Zootomicum.

demonſtrating their nature, ſo that, from his inſtructions, the hearers may learn the poſition, communication, ſtructure, actions, and uſes of the ſeveral parts, is called an anatomiſt.

Its means. 4. The means by which the anatomiſt performs this, are principally ſection, or the opening the body, and ſeparating its parts; and the aſſiſtance of microſcopes, and of injections; with ſome others to be treated of hereafter, in their places. The means by which the young ſtudent is to qualify himſelf, in the ſcience, are, 1. Diligent attention while the anatomiſt is diſſecting. 2. Imitation of what he has been doing, as well in human ſubjects as in brutes. 3. A careful peruſal of the authors, who have written well on the ſubject.

The beſt writers on it. 5. The principal and moſt neceſſary to be conſulted, among the earlier writers, are Galen, Veſalius, C. Stephanus, Euſtachius, Ingraſſias, Columbus, Fallopius, Coiterus, Vidius, Varolius, Valverda, Fabricius ab Aquapendente, Bauhine, Spigelius, Caſſerius, Laurentius, Aſellius, Laurembergius, Pavius, Caſp. Bartholine the elder, M. A. Severinus, and C. Hoffman.

6. Among the after-writers, the moſt neceſſary to be conſulted are Harvey, Veſlingius, Riolanus the ſon, Wharton, Gliſſon, Pecquet, Willis, Lower, Highmore, Needham, Marchett, Molinet, Diemerbrock, Kerkringius, Blaſius, Steno, Malpighi, Bellini, Rolfinch, Schneider, Hornius, De Graaf, Swammerdam, T. Bartholine, Liſerus, Gagliardus, Peyerus, Bourdonus, Drelincurt, Nuck, and Havers.

7. And finally, among the moderns, Ruyſch, Bidloo, Du Verney, Bohn, Bruner, Vieuſſens, Ortlobius, Verheyen, Schelhamer, J. Maurice Hoffman, Dionis, Cowper, Ridley, C. Bartholine

the younger, Keil, How, Morgagni, Valſalva, Fanton, Pacchionus, Bianchus, Drake, Vercelloneus, Cheſelden, Arent. Cant, Noguez, and Santorini. To theſe might be added a number of others; but it is not neceſſary to make this liſt too long: Magnet's Bibliotheca and Theatrum Anatomicum, will give an account of many of them; and we are to add, that the diſcoveries and new obſervations in anatomy, recorded in the works of the royal ſocieties of France, England, Italy, Germany, and other parts of the world, are by no means to be paſſed over. The ſtudent, who wiſhes to be acquainted with more of the anatomical writers, may turn to Gœlickius's Hiſtory of Anatomy, Dr. James Douglas's Specimen of a Bibliographia Anatomica, and to our author's oration de Incrementis Anatomes, publiſhed at Helmſtadt in the year 1720.

8. The intent and ends of anatomy are various: the primary one is an acquaintance with, and an admiration of, the work of the Creator in the human frame: a ſerious contemplation of the ſtructure of this amazing fabrick, of the appropriated figure of the ſeveral parts of it, their connections, communications, actions and uſes, is one of the ſtrongeſt of all arguments againſt atheiſm: it carries a proof not only of the exiſtence of a Deity, but at the ſame time of his amazing greatneſs and wiſdom; and leads the obſerver immediately to the adoration, as well as the acknowledgment, of a God. The glory of the Creator may, therefore, be very juſtly declared to be the great and primary end of anatomy. The ſcience, treated in this light, may therefore be called philoſophical, phyſical, or theological anatomy, and is highly uſeful to every one who ſtudies true wiſdom and theology.

Its end and intents.

9. The ſecondary ends of anatomy are many. Of theſe, the firſt is health: this is the greateſt good we can know in this life; and nothing can lead us more immediately to the knowledge of the means of preſerving it, or of reſtoring it when impaired by diſeaſes, or even preventing the acceſs of them, than a true knowledge of the ſtructure of that frame which is injured by them. Anatomy, in this ſenſe, is ſtiled medical; and many eſtabliſh this as the firſt ſpecies of it, and the preſerving and reſtoring health as its primary object.

10. Another of the ſecondary ends of this ſcience, is the determining the cauſe of ſuſpicious deaths. If the bodies of perſons newly dead be expoſed for enquiry into the cauſe of their dying, and are ordered to be opened, that, from the inſpection of the parts, a true relation of the occaſion of the violent or ſuſpected death may be delivered, and a proper judgment formed on that, whether a blow, a wound, or poiſon, or any other violence, have occaſioned the death of the perſon, or whether it were owing to ſome other more common or natural cauſe, whether internal or external; nothing can enable a perſon to execute this with juſtice and truth, but a knowledge of anatomy. The ſcience, in this light, is called juridical anatomy. There are, beſide theſe, alſo a number of other caſes, which concern a court of judicature, in which a knowledge of anatomy is equally neceſſary. Impotency, barrenneſs, and cauſes of divorce, can only be properly adjudged by means of a ſkill in this ſcience: nor can diſputes about the true times of pregnancy and delivery, abortions, pretended parturition, the vitality of the child, the cauſes of its death, the mortality of wounds, and a multitude of other medico-

legal caſes, of as great importance as theſe, be any way rationally adjuſted or determined, but by means of a knowledge of this ſcience *.

11. A third and very great end of anatomy, is the determining the cauſe and manner of the death of diſeaſed perſons, from a ſubſequent diſſection of the body. This is called practical anatomy, as of the utmoſt uſe in the practice of phyſick. The latent cauſes of multitudes of diſeaſes, have been long ſince diſcovered by means of theſe diſſections; and, to this time, the ſame means continue to furniſh us with ſtill other diſcoveries of a like kind, of what the anatomiſts themſelves, of all ages before, had been ignorant of †. The knowledge of the real cauſes of a diſeaſe, is the firſt rational ſtep towards its cure; and, without the aſſiſtance of diſſections, how was the world to have been truly informed of the nature of the ſtone in the bladder, of an empyema, an aſcites, hernias, cataracts, glaucomas, and a number of others.

Anatomy of four kinds.

12. Anatomy, therefore, from its various intents and ends, may be ſaid to be of four kinds: 1. The philoſophick, phyſiologick, or theological. 2. The juridical, or medico-legal. 3. The medical, or that leading immediately to the cure of diſeaſes; and, 4. The ſpeculative or theoretick.

The ſpeculative or theoretick anatomiſt is one, who, without ever having diſſected himſelf, has acquired ſuch a degree of knowledge in the ſtructure of the body, as contents him, from reading the beſt authors on the ſubject, and attending to the diſſections made by others. Many people are

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* The author has treated this ſubject much more largely in an academical oration, de Medicinæ & cumprimis Anatomes utilitate in Juriſprudentia.

† See Bonet's Sepulchretum Anatomicum.

ſaid to underſtand anatomy in this ſenſe, who have never been at the pains of going thro' the laborious part of the means neceſſary to the acquiring a knowledge of it. In contradiſtinction from theſe ſpeculative anatomiſts, he who employs himſelf in diſſecting bodies, in ſeparating, making preparations of, and enquiring nicely into the ſtructure of the parts, is called the practical anatomiſt; and the ſcience itſelf is, in this light, called practical anatomy.

Its utility. 13. Upon the whole it appears, that the uſe of anatomy is very great, nor is confined to the bounds of medicine alone. The theologiſt, and the philoſopher, ought to know it; and the magiſtrate, or the ſeveral members of a court of judicature, are under a neceſſity of having information from it: the phyſician and the ſurgeon, however, are the people to whom it is moſt immediately neceſſary, and who cannot do juſtice to the world in their profeſſions without a knowledge of it. What the needle is to the mariner, that is anatomy to both theſe. Whatever the ignorant or malevolent may ſay againſt it, there is no doubt but both theſe moſt uſeful ſciences would be rather detrimental than beneficial to mankind, without the aſſiſtance of anatomy to direct them.

CHAP. II.

Of Anatomical Inſtruments.

Inſtruments. 14. THE anatomiſt muſt neceſſarily be furniſhed with his apparatus and inſtruments: without theſe, diſſections, ſeparation of the parts, and inveſtigations of their fabrick and uſes, cannot be performed. The anatomiſts of ſeveral ages have invented a multitude of them;

but a much ſmaller number than they deſcribe, will do all that is neceſſary.

15. The firſt article of the anatomiſt's apparatus muſt be a table, for the laying the body to be diſſected upon. He muſt alſo have a ſecond table, appropriated to the diſſections of living animals, with cords for the fixing them down. He muſt have a number of diſſecting knives, which are to be ſtrait, and to have an edge only on one ſide. Knives with two edges, crooked ones, and a multitude of others, deviſed for this purpoſe, are ſuperfluous, and of leſs convenient uſe than theſe plain and ſimple ones. Of theſe, however, ſome muſt be larger, ſome ſmaller; ſome more delicate, and others more robuſt. Beſide theſe, he muſt have forceps, forfex's, volſella's, hooks, and ſtyles of different ſizes, with briſtles and hairs of different ſtrength and fineneſs, for the inveſtigation of the ducts in ſome parts; ſtrait and crooked needles, of various ſizes, muſt alſo be in readineſs for various purpoſes; and thread, finer and coarſer, and pins, large and robuſt, as well as ſmaller. He muſt alſo have ſaws, ſcalpra, clavæ, and mallei, and an elevatory for opening the ſkull: and, finally, tubes of various apertures and dimenſions for the inflating the ducts and veſſels, and alſo the inteſtines, ſtomach, and urinary bladder: the lungs are moſt commodiouſly inflated by means of bellows, with proper nozels.

16. Finally, microſcopes are neceſſary for the examination of the ſmaller and finer parts. And ſyringes of braſs, or other materials, are as neceſſary as any thing already mentioned. There muſt be, at leaſt, two of theſe for injections: the one for throwing in waxy, or other viſcous, thick, or ſolid matter; the other, for only injecting fluids. Theſe muſt have tubes of different diameters

fitted to them, according to the different purpoſes they are to ſerve for. Beſide theſe alſo, a tube of iron is neceſſary for the introducing crude mercury into the veſſels. Spunges muſt always be in readineſs for the abſorbing extravaſated humours, and the cleaning the parts; a hone and ſtrap, for giving of an edge to the knives; and borers of various ſizes, for perforating the bones. Braſs wire muſt not be wanting, for the connecting the bones of a ſkeleton; and the air-pump may be of great uſe in the filling the veſſels, and for many other purpoſes. The anatomiſt ought alſo to have his diſſecting-frock and ſleeves, to keep the blood, &c. from his cloaths and linnen; and a number of diſhes, pots, and other veſſels, with utenſils of that kind, may be added at the diſſecter's pleaſure.

CHAP. III.

Of the names and diviſion of the external parts of the human body.

External parts of the body.

17. AFTER the enumeration of the inſtruments neceſſary for the anatomiſt, before we proceed to the examination of the ſeveral parts of the human body, it is neceſſary to ſay ſomething of the appellations of them, and firſt of thoſe of the external ones. It is not, under this head, our buſineſs to lay down thoſe common and generally uſed appellations which are in the mouths of every body; nor, on the other hand, to treat of thoſe more particular ones, which occur in the inveſtigation of the parts themſelves; as of the eye, the ear, the noſe, and the like. The firſt are unneceſſary to be mentioned at all; the others are to be hereafter explained in their place,

place. The more general terms among thoſe not univerſally known, are the buſineſs of this chapter.

18. The human body is divided by anatomiſts into two parts: the *trunk*, and the *limbs*, or the *extremities*. The trunk conſiſts of the head, neck, thorax, and abdomen. The limbs are divided into the upper and the lower: the upper are the arms and hands; the lower, the legs and feet. Their diviſion.

19. In the head, the firſt parts to be diſtinguiſhed are the hairy part, or *ſcalp*, and the naked part, or the *face*. After this, we are to attend to the diviſion into the ſinciput, and occiput, or the *fore* and *hinder part of the head*; the *temples*, the *crown* or *vertex*, the *bucca*, the cheeks, and the *philtrum* or *lacuna*. The reſt is obvious, and ſufficiently known.

In the neck, the jugulum or throat, and the pomum adami, are to be regarded. In the thorax, the præcordia *, and the back. In the abdomen, the ſcrobiculus cordis, the epigaſtrick region, the hypocondria, the regio iliaca, the loins, the inguina, the pubes, the perinæum, and the regio iſchiatica.

20. In the upper extremities, or limbs, we are to obſerve the ſhoulder or humerus, the axilla or ala the arm-pit, the arm, the cubitus, the carpus or wriſt, the metacarpus, the palm and the back of the hand, and the fingers.

In the lower extremities, we are to diſtinguiſh the femur or thigh, the knee, the leg, the ſhin, the malleoli, the tarſus, the metatarſus, the ſoal of the foot, and the toes.

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* Authors are not well agreed about what is to be underſtood by the term Præcordia. Faber, and moſt of the lexicographers, underſtand by it the anterior part of the breaſt, or all that part of it which is placed before the heart. But Celſus uſes it to expreſs the whole breaſt; and that the antient Romans did ſo, is evident from Virgil: redit in præcordia virtus.

21. It might ſeem not improper, from this enumeration of the principal and obvious parts of the body, to proceed to the common integuments of it; and from thoſe, to the internal parts: but as beginners will better underſtand the deſcriptions of the compound parts, after they have conceived proper ideas of the more ſimple ones, it will be beſt to diſcourſe of thoſe firſt.

The ſimple ſolid parts.

22. The parts of the human body are either ſolid and continent, or fluid and contained. The ſolid parts are to be divided into ſuch as are ſimilar or ſimple in their ſtructure, and ſuch as are diſſimilar or compound. Theſe laſt are called by the generality of authors, *organical parts.*

The ſimilar or ſimple parts of the human body, if we would ſpeak with exact propriety, are only the *fibres*; for of theſe are all the other parts conſtructed in an amazing manner. But anatomiſts underſtand the term in a laxer ſenſe, and refer to this head of ſimple parts a number of others, which ſeem ſimple or ſimilar to the ſenſes; or, in more expreſs words, which are more ſimple than the more evidently organized ones; ſuch as the lungs, the heart, the hand, &c. Theſe ſimple parts, as they call them, are thoſe which are employed in the formation of the others which they call organical; tho' not all of theſe to each of thoſe.

Of the number of ſimple parts, in this accuſtomed ſenſe of the term, are arteries, veins, nerves, membranes, ligaments, muſcles and tendons; with fat, lymphatick and lacteal veſſels, excretory ducts, bones, cartilages, glandules, the nails, and the hair. The other ſolid parts of the human body are referred to the diſſimilar or the organical ones; and theſe are uſually divided again into the more noble and the leſs noble ones, according to the greater or leſſer uſes they are of in the œconomy, or their being more or leſs immediately neceſſary to life.

Fibres.

23. A fibre is a perfectly ſimple body, or at leaſt as ſimple as any thing viſible in the human ſtructure. It is fine and ſlender like a thread, and ſerves to the conſtruction and formation of all the other parts. Hence ſome fibres are hard as the boney ones, and others ſoft as thoſe deſtined for the formation of all the other parts. They are divided alſo, according to their ſituation, into ſuch as are ſtrait, oblique, tranſverſe, annular and ſpiral. They are found arranged in all theſe directions, in different parts, according to the neceſſity of their manner of conformation, and of their uſe.

Arteries.

24. An artery is an elaſtick canal or veſſel, endued, while the ſubject is living, with a pulſatory motion. It is of a conic figure; and its office is to carry the blood from the heart to the ſeveral other parts of the body. The veins, on the contrary, are veſſels of the figure of an inverted cone; not endued with pulſation; and whoſe office it is to carry back, from all parts of the body, the blood, which the arteries had conveyed thither, to the heart again.

Veins.

Nerves.

25. The nerves are white, cylindrick bodies, proceeding, like threads, from the brain and ſpinal marrow, to all parts of the body; and ſerving to the purpoſes of ſenſation, motion, and nutrition.

Membranes.

26. Membranes are parts which reſemble, in ſome degree, pieces of linnen or paper, and are deſtined to various uſes in the human ſtructure. What are called tunics, ſcarce in any thing differ from membranes. The words are often uſed indifferently, as names of either. The ligaments

Ligaments.

alſo are nearly allied to theſe. Their different uſe is the principal thing which diſtinguiſhes them. Where ſubſtances of this kind are deſtined to the joining two bones together, in a very firm manner, they aſſume the name of ligaments: where their office is the ſurrounding or incloſing things, they are called tunics and membranes.

There are, however, ſome ligaments which are very like nerves or tendons, and are very different from membranes in their rounded or cylindrick figure: ſuch are thoſe in the junctures of the thigh and the patella.

Muſcles. 27. The muſcles are thoſe fleſhy red parts of the body, which conſtitute the inſtruments of motion; and are what we call, in the whole, fleſh. Tendons, and Aponeuroſes. The tendons are white, firm, and tenacious parts, continuous to theſe, and uſually forming their extremities. Theſe, if they are broad, and expanded in the manner of membranes, are not called tendons, but aponeuroſes.

Fat. 28. The fat is a thick, oily matter, ſecreted from the blood, and contained in membranaceous cells. It is deſtined for various purpoſes. What is lodged within the cavities of the bones, and Marrow. called marrow, ſcarce differs at all from this, unleſs in its ſubtility, and the place where it is lodged *.

Lymphaticks. 29. The lymphatic veſſels are ſubtile canals, of a fine texture, pellucid, and deſtined for the carrying a thin, fine, and almoſt aqueous liquor, from ſeveral parts of the body toward the heart.

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* The fat might be naturally enough referred to the number of the fluid parts; and indeed is, by many authors, treated of among them: but as, in diſſection, it always offers itſelf in a ſolid form, and its cellules are always evidently ſolid, it ſeems more natural, in a work of this kind, to give it a place among the ſolids.

The lacteal veſſels are tubes of a like kind, but they are placed only in the meſentery and inteſtines. Their office is to receive the chyle, which is a liquor of a milky colour, produced by the concoction of our food, from the inteſtines, and to carry it thro' the meſentery into an appropriated duct, formed for the reception of it. Lacteals.

30. The excretory ducts, are canals deſtined for the reception of a fluid ſecreted in certain glandules, and other viſcera, and for the excretion of it in the appropriated places. Excretory ducts.

31. The bones are hard, white bodies, deſtined for the ſupport and defence of the ſofter and weaker parts. Bones.

What we call cartilages, are bodies much approaching to the nature of bones; but lubricous, flexible, and elaſtick. They contain either none at all, or, at the utmoſt, but a very little of the medullary matter, and ſerve for various uſes. Cartilages

32. The nails are parts, which, in many reſpects, approach greatly to the nature of cartilages. They are thin laminæ, of a horny ſubſtance, affixed to the extremities of the fingers and of the toes. The hairs are filaments placed on various parts of the body, eſpecially on the head, and growing out a great way from the ſurface. Nails.

33. Glands are parts of a peculiar ſtructure: the antients ſuppoſed them formed of a different kind of fleſh from that of the reſt of the body. They are, in reality, compoſed of a congeries of extremely ſmall arteries, veins and nerves, and uſually have alſo an excretory duct. They are ſurrounded by a peculiar membrane, and are of various figures, colours, and conſiſtencies, as they are deſtined to different offices. Their ſeveral buſineſs is the ſecreting from the blood ſome fluid: but of this, more in its proper place. Glands.

Fluids of the human body.

34. The fluids of the body, or the parts contained in the ſeveral ſolids already ennumerated, are the following: chyle, milk, blood, ſerum, lymph, animal ſpirits, ſaliva, gall, the liquor of the pancreas, that of the ſtomach, of the inteſtines, of the œſophagus, of the brain, of the eyes, of the thorax, of the pericardium, of the abdomen, of the tunica vaginalis of the teſtes, the ſemen, and the liquor of the proſtatæ; the mucus of the noſe, of the tonſils, of the articulations, of the urethra, of the uterus, of the vagina, of the tubes of the uterus; the humor of the ova, and that in which the fœtus ſwims; the ear-wax, the urine, and ſweat.

General diviſion of anatomy.

35. The buſineſs of anatomy is uſually divided into two parts, under the names of oſteology and ſarcology; the firſt comprehending the doctrine of the bones, or harder parts; the latter, of the fleſh, and ſofter. It is moſt convenient to enter on the oſteological part firſt, as on the bones depends the baſis and foundation of all the reſt, and as the other parts will be the more eaſily underſtood after the deſcriptions of theſe.

A
COMPENDIUM
OF
ANATOMY.

BOOK II.

Of OSTEOLOGY.

CHAP. I.

Of the Bones in general.

Oſteology

36. WHOEVER is deſirous of attaining to a perfect knowledge of the ſtructure and parts of the human body, muſt firſt inform himſelf perfectly of the bones.

Its object.

37. The objects of oſteology are the bones, whether they be recent or dry'd, whether they have belonged to an infant or an adult; and with the bones are to be conſidered their perioſteum, medulla or marrow, the ligaments, and the cartilages.

A ſkeleton.

38. An artificial conjunction of the bones, in the ſame order and ſituation in which they are placed in the body, is called a ſkeleton.

39. The ſtudy of the bones is to be conſidered in two lights, as theoretical, or as practical. In the firſt ſenſe, oſteology only extends to the ex-

ternal conformation, and uſe of the bones: in the latter, or practical ſenſe, it comprehends the more intimate knowledge of their interior ſtructure and connections. 1. If their internal parts are to be examined, they are to be cut or broken. 2. If their articulations are the ſubject of enquiry, the ligaments about their junctures are to be examined in diſſected bodies. 3. If the making a ſkeleton be the intent, their preparation and preſervation come into this branch.

Bones, their ſubſtance.

40. The ſubſtance of the bones may be conſidered either chemically or anatomically. The chemical examination ſucceeds beſt with the bones of infants and embryo's; the anatomical enquiry into their nature, with thoſe of adults.

Examined chemically.

41. In the chemical analyſis by the retort, bones afford, with the different degrees of fire carefully managed, a water, a ſalt, a ſpirit, and an oil. After this, there remains in the retort a merely earthy ſubſtance, retaining the exact figure of the bones employed, but brittle: and the ſpirit produced from them, may, by a rectification, be ſeparated into water, ſalt, and oil. Hence it appears, that bones are compoſed of four principles or elements, which are connected ſo together, as to form a very ſtrong and durable compages.

Examined anatomically.

42. The bones, anatomically examined, are found, firſt of all, in the time of their formation and origin, to be like ſo many ſoft membranes, compoſed of a number of fibres and veſſels of an extreme ſubtility and minuteneſs, from which they receive their nutrition, and are increaſed in ſize, and hardened. Theſe fibres and membranes grow by degrees harder, and more cartilaginous; and, in fine, are arranged into a ſort of tables, or lamellæ. Over the lamellæ firſt formed, there are expanded, by degrees, new ſtrata of fibres and

veſſels: each ſtratum, thus added, forms a new lamella upon the old ones; and all theſe, by degrees, growing harder, and being connected to one another, by means of oblique and tranverſe fibrillæ, the compages becomes gradually more cloſe, and the matter more dry; and thus, at length, a bone is formed *. The bone is thicker or thinner, the more or the fewer of theſe lamellæ and fibres are laid over one another for the formation of it; and theſe leave between them a multitude of cavities, ſome ſtrait, others oblique, ſome longitudinal, others tranverſe, all which are filled up with a fat, medullary juice.

Their differences.

43. The bones of the ſeveral parts of the body differ from one another in their ſizes, their cavities, their qualities, their figures, and their uſes, as will appear, when we come to a particular conſideration of them: but, before we enter on that, ſome general obſervations on them are not to be omitted.

44. In every bone we examine, there come into conſideration, 1. The bone itſelf. 2. Its cavities. 3. Its conjunctions with the other bones. 4. Its uſes.

45. In regard to the bone itſelf, three things are to be conſidered, 1. The body of it, which, according to Galen, is called the diaphyſis. 2. The apophyſes; and, 3. The epiphyſes.

46. The diaphyſis, or body of the bone, is its larger and principal portion, which, in young ſubjects, is the firſt part that indurates; and is, as it were, in the place of a baſis or foundation to the reſt.

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* See Harvey on the generation of animals, Kerkring's Oſteogenia fœtus, Ruyſch's Theſaur. Anat. Malpighi's Anatome plantarum; Gagliard's Anat. oſſium, and Havers's Oſteologia.

Apophyſis. 47. An apophyſis is a protuberance or excreſcence from the body of the bone, of which it is a true continuous part, as a branch is of a tree.

48. This part of a bone has ſeveral other names beſides apophyſis. The terms proceſs, prominence, protuberance, eminence, tubercle, and tuberoſity, ſo frequent in the works of the anatomical authors, all ſignify nearly the ſame thing.

49. The apophyſes alſo receive ſeveral additions to theſe names, by way of epithet, expreſſing their peculiar ſituation, uſe, or figure: ſuch are coracoides, mammillaris, maſtoides, glenoides, coronoides, ſtyloides, condyloides, pterygoides, odontoides or dentiformis, anchoroides, ſpinoſa, recta, obliqua, tranſverſa, ſuperficialis, and the like.

The head of the apophyſis has alſo its peculiar names; ſuch as condylus, corone, ſpina, ſupercilium, labrum, and the like, as will be ſeen more at large, when we come to treat of the bones ſingly.

50. The principal uſes of the apophyſes of the bones, are, 1. For the making the better articulations, whether theſe be intended to have motion or to be fixed. 2. To afford a proper and firm place of origination and inſertion for the muſcles: and, 3. To defend the other parts. The more ſpecifick and peculiar uſes, will be delivered under the heads of the ſeveral different bones.

Epiphyſis. 51. An epiphyſis is a bony ſubſtance, or, as it were, a leſſer bone, affixed to a larger or principal bone by the intervention of a cartilage. In young ſubjects, theſe epiphyſes are not continuous to the principal bone; but are only connected by the intermediate cartilage, and hence they are called appendages to the bones.

52. The principal things to be obſerved of theſe epiphyſes are, 1. That they are all cartilaginous in infants, and tho' they afterwards grow by degrees more hard; yet they never arrive at the true denſity of a bone, but are always lax and ſpongy. 2. That moſt of them degenerate into apophyſes in adults. 3. That they do not grow along the plane ſurface of the bone, but unequally, or by a mutual ingreſs with the body of it. 4. That their nature and conjunctions are much more obvious in younger than in older ſubjects. 5. That the body of the principal bone itſelf is ſpongy, and tender about the place of the conjunction.

53. The uſe of the epiphyſes is very different in infants and in adults.

54. In adults they ſeem to ſerve the bones, which contain large quantities of marrow, by way of operculm, that this ſoft matter may not run out. 2. They are of ſervice to the articulations, rendering the motions more eaſy as well as more determinate. 3. They make the whole bone lighter than it would be, if their place were ſupplied by abſolute boney matter, as they are much more ſpongy. 4. They greatly increaſe the power of the muſcles about the tendons, by means of their prominences. 5. They add greatly to the ſize of the places deſtined for receiving the inſertions of the muſcles. 6. They give a firmer coheſion to the ligaments which ſerve in the articulations, and allow an entrance to the blood-veſſels.

55. The uſes of the epiphyſes in infants, are, 1. That, by means of their yielding ſoftneſs, they may give way to the compreſſion in the uterus, and ſuffer the whole bulk to be more folded together than otherwiſe it could, ſo that it may lie in a

ſmaller compaſs. 2. That they may give way to the elongation and growth of the bones, that, as the body grows, they may be proportionably extended, as neceſſary. 3. That they may prevent the frequent fractures, which would otherwiſe unqueſtionably happen to children from their falls, and the other accidents they are liable to.

Cavities. 56. Of the cavities of the ſeveral bones, ſome are made for the ſake of the articulations, ſome for other reaſons. Thoſe of the former kind are called by the various names of cotyle, acetabulum, and glene: they are deeper in freſh bones than in ſuch as have been dried, becauſe of the cartilaginous eminences, intended by nature for the aſſiſtance of the articulation, being taken away in theſe. Theſe cavities contain a fatty, mucous liquor, ſecreted by a peculiar ſet of glands, called the mucous or mucilaginous glands, and by the ligaments * of the articulations, and probably alſo from the marrow itſelf; this is deſtined for the lubricating the bones, and facilitating their moving on one another.

57. The cavities in the bones, not ſerving for the purpoſe of articulation, are of two kinds, internal and external. The internal ones, if large, contain marrow; if ſmaller, a red medullary juice, or oily matter. Theſe latter are called the cellules of the bones.

58. The external cavities of this kind have various names, according to their various figure: they are called foveæ, foſſæ, foramina, canals and ducts, ſinus's, ſulcus's, and inciſuræ.

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* It appears extremely probable, that a part of this fluid is ſecreted from the ligaments themſelves; ſince the glands, which are in general ſaid to ſecrete it, are not to be found in ſome of the articulations; and the membranaceous parts, of which nature the ligaments evidently are, in other places do ſecrete ſuch a fluid.

59. The conjunctions or articulations of the bones, are generally treated of before the ſeveral bones of the ſkeleton are explained; but this is certainly erroneous. The young ſtudent will ſcarce find it poſſible to underſtand theſe parts and the uſes of the bones, unleſs he firſt underſtand the figure, ſtructure, and offices of the ſeveral bones themſelves; wherefore we ſhall reſerve this for the laſt part of our oſteology, and begin what we have farther to ſay in this place, with the explication of the ſeveral bones which conſtitute a ſkeleton.

CHAP. II.

Of the bones of the head.

60. THE ſkeleton is divided, like the whole body, into two parts; the trunk, and the extremities, or limbs. The trunk of the ſkeleton conſiſts of the head, the ſpine, the bones of the breaſt, and the oſſa innominata. Diviſion of a ſkeleton.

61. The head expreſſes that part of the ſkeleton which is placed upon the top vertebra of the neck: it is divided into the cranium and maxillæ.

62. The cranium, called alſo the calvaria, is that part of the head which forms its great boney cavity, which contains the brain in the living ſubject: the ſeveral bones, therefore, which go to the formation of this cavity, are called oſſa cranii. Skull.

63. In the cranium, we are to conſider its ſhape, which is oval; its exterior ſurface, which is convex; and its interior, which is concave; its ſize; its thickneſs, which is unequal in the ſeveral parts; its ſubſtance, which is formed of two lamellæ or tables, an exterior, and an interior, between which there is a diploë or meditullium; its

compoſition, which is of ſeveral bones; and the connections of theſe ſeveral bones, which is by ſutures; and its uſes.

64. The bones of the cranium are eight, viz. The os frontis, the two parietal bones, the two bones of the temples, the occipital, the ſphenoides, and the ethmoides *.

Os frontis. 65. The os frontis, which is called alſo the coronal bone, is the firſt of the bones of the cranium to be examined: it is double in infants, but in adults it is uſually ſingle; ſometimes, however, it is divided in theſe into two parts, down to the noſe. In this we are to obſerve its ſituation, its irregular figure, its connection, its internal ſurface, in which there are a fovea or furrow, and an eminence, to be noted, to which the longitudinal ſinus of the dura mater adheres: we are alſo to regard its external ſuperficies, on which we are to obſerve the place where the frontal and temporal muſcles, and the cartilaginous annule of the muſculus trochlearis of the eye, are ſituated: there are ſeven apophyſes alſo on it, ſix of which concur together to form the orbit, and the ſeventh ſuſtains the bones of the noſe. We are then to obſerve the frontal ſinuſes †, their uſe and various conſtitution in adults, and their ſurpriſing origin in children ‡.

Oſſa parietalia. 66. The parietal bones, called alſo the oſſa bregmatis and oſſa ſincipitis, make the ſecond and third bones of the cranium. In theſe we are to obſerve

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* Many of the anatomical writers give other names, beſide theſe, to the bones of the ſkull; but theſe are the moſt uſed and received. The ennumeration of the others, would only confuſe the young ſtudent.

† See Schneider de Catarrh. fig. 1. p. 484. Palfin's Oſteolog. T. 1. and 2.

‡ The uſes of theſe, and the other foramina of the bones of the ſkull, will be delivered together hereafter.

obſerve the ſituation, the figure, which is nearly a ſquare, their ſize, their connections, and their thickneſs. Their external ſurface is to be examined; and in it, the place of part of the temporal muſcle, or crota~~phites~~. Then their internal ſurface, in which there are furrows repreſenting little ſhrubs: theſe are formed by the arteries of the dura mater; and beſide theſe, there are other foveæ; and finally, we are to obſerve the place called the bregma, and in infants the fontanella, or fons pulſatilis, and the manner in which it is found in them.

Oſſa temporum.

67. The temporal bones, called alſo the oſſa ſquammoſa and petroſa, make the fourth and fifth bones of the cranium. In theſe we are to regard the ſituation, the figure, which is very irregular; the connection, the ſubſtance, which is, as their other names expreſs, ſquammoſe and very hard: their four apophyſes, which are, the jugal or zygomatick, the mammillar or maſtoide, the ſtyloide, and the petroſe: the place where the lower jaw is articulated: the meatus auditorius, or auditory paſſage: the place where the ligament of the ear is inſerted, near the maſtoide proceſs: the ſigmoidal foſſæ, where the lateral ſinus's of the dura mater are placed: the inciſure under the maſtoide proceſs, where the biventer muſcle has its origination: the fovea, in which is buried the ſinus of the jugular vein: the ſinuſes in the maſtoide proceſſes, opening into the cavity of the tympanum: and, finally, we are to inform ourſelves of the ſtate of theſe bones in fœtus's, in which they are formed of the petroſe and ſquammoſe parts, on a boney circle or annulus; on the fiſſure of which the membrane of the tympanum grows, which afterwards, in proceſs of time, be-

comes wonderfully expanded into the boney meatus auditorius.

Oſſa auditus.

68. In the temporal bone, and particularly in its petroſe part, are to be obſerved the cavity of the tympanum; and, in it, the oſſicula auditoria, or bones ſerving to the ſenſe of hearing. Theſe bones are commonly ſaid to be four, and there are as many foramina. The firſt of them is called the malleus: in this we are to obſerve the head, the neck, and the handle, which is joined to the membrane of the tympanum. Two apophyſes are alſo to be remarked in this: the one very long, called, from its ſuppoſed diſcoverer, Raviana, but erroneouſly; for it had been before deſcribed by Folius *. This ſerves for the inſertion of the external muſcle of the malleus. The ſecond is the incus, in which we are to obſerve the body of the bone, and its fovea, or hollow, ſerving for its articulation with the malleus, and its two crura or legs; to the longer of which there is joined another bone, called the ſtapes. In this we are to obſerve the head, which is joined to the longer leg of the incus; its baſis, which ſtands on the feneſtra ovalis of the labyrinth of the ear; and its two lateral parts, which have their internal ſurface furrowed.

What is generally called the fourth bone of the ear, is placed between the incus and the ſtapes, and is named the os orbiculare; but this is not truly a diſtinct or ſeparate bone, but is merely an epiphyſis of the longer leg of the incus.

Foramina of the ear.

Of the foramina, the firſt is the feneſtra ovalis, on which the baſe of the ſtapes ſtands. Near this

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* See Boerhaave's Inſtit. Med. cap. de Auditu; and Folii nova auris internæ deſcriptio; as alſo Barthol. Anat. Reform. p. 715. but this laſt author's figure is not ſo expreſſive as it might be.

is the ſecond, which is called the feneſtra rotunda: this leads to the cochlea, the other to the veſtibule of the ear. The third foramen, by means of a canal, is carried to the mouth: this is called the euſtachian duct, or tube: 'tis through this that ſome people have a way of diſcharging, at the ears, the ſmoak of tobacco taken in at the mouth; and 'tis by means of this alſo, that people, ſubject to deafneſs, hear beſt when their mouths are open. The fourth foramen opens into the cellules of the maſtoide proceſs. All theſe are of uſe in hearing.

Labyrinth of the ear.

69. The inner part of the ear has obtained, from its various and wonderful meanders, the name of the labyrinth. In this we are to remark, the cavity, conſtituting the middle of the labyrinth, and called its veſtibule: on one part of this are three canals, known by the name of the ſemicircular ones, and diſtinguiſhed by the epithets of the largeſt, the middle one, and the leaſt: theſe open by five orifices into the veſtibule. In the other part is the cochlea, which forms two ſpiral windings and a half: in this we are to obſerve the nucleus, and the canal, which is divided into two by a ſpiral lamina. The upper of theſe opens into the veſtibule, and is called the ſcala veſtibuli: the lower, tending toward the hollow of the tympanum, by the feneſtra rotunda, is called the ſcala tympani by Valſalva *. Finally, we are to remark the canals of the auditory nerve: 1. The common and larger, in which there are little apertures into the labyrinth: and, 2. The proper, narrower, and longer, terminating partly by a little aperture in the cavity of the cranium, and partly in the aqueduct of Fallopius †.

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* Tract. de Aura humana.

† Ibid, Tab. 7. fig.

70.

Os occipitis. 70. The os occipitis is the ſixth bone of the cranium. In this we are to obſerve the ſituation, the figure, which is irregular, and the ſtate of it in infants, in whom it uſually is compoſed of four pieces or fragments. After this we are to regard its connections, its ſubſtance, which is very thick; its three apophyſes, two of which are condyloide, and ſerve for the articulation of it with the upper vertebra of the neck, and ſupport the whole head: the third is extended to the ſella equina. In the internal ſurface of this bone, in adults, there is a figure of a croſs, and to this adhere the ſinuſes and proceſſes of the dura mater; and within this there are alſo four hollows, in which the poſterior lobes of the brain and the cerebellum lie. In the external ſuperficies, there are ſeveral ſuperficial eminences and depreſſions to be obſerved after the great foramen: theſe ſerve for the inſertions of ſeveral of the muſcles of the head.

Os ſphenoides. 71. The ſeventh bone of the cranium is the os ſphenoides, called alſo the os cuneiforme and baſilare: this is fixed, in the manner of a wedge, among the other bones of the cranium; and ſerves as a baſis, as it were, to ſupport ſeveral of them, and ſome of thoſe of the upper jaw. The figure of this bone is very irregular: in its upper part is ſeen the ſella equina, or turcica, under which there is a ſinus, called the ſphenoidal ſinus: this is ſometimes double, and opens into the noſtrils: ſometimes it is totally wanting.

The ſphenoides has thirteen apophyſes; ſix of them are internal, and are placed near the ſella equina; and the other ſeven are external: four of theſe are of a pterygoide form, and thence named; two, of the other three, are very ſmall and ſtyloide; and the ſeventh is placed under the vomer. There are alſo three foſſæ or cavities in this bone; one in the ſella equina, and the other two between the pterygoide apophyſes.

72. The eighth and laſt bone of the cranium is the os ethmoides, or os cribroſum, or cribriforme. In this we are to obſerve, after the ſituation, its extenſion thro' the noſtrils and orbits, its figure, its connection, and its ſtate in infants; its four apophyſes; the criſta galli, which is the upper part of the ſeptum narium; the two oſſa ſpongioſa ſuperiora, which are called alſo by ſome turbinata *: to which Morgagni has added two other ſmaller ones †; the cribroſe, cavernoſe, papyraceous or plane parts; and under this the various little ſinuſes. And, finally, we are to enquire into the uſes of theſe ſeveral parts.

Os cribroſum.

73. All the bones of the cranium are found to be imperfect in new-born infants. The ſinus and its meditullium are almoſt wholly wanting: the boney fibres, in the formation of almoſt all of them, are carried, in form of rays, from a centre, toward the circumference; and moſt of them are not ſingle, as in adults; but are compoſed each of ſeveral fruſtules, or little pieces: nor are the ſutures at that time formed: And, finally, there are frequently triquetrous little bones between them.

74. In adults, the ſeveral bones of the ſkull are, in general, joined by ſutures. Theſe ſutures are either common or proper: the proper ſutures are diſtinguiſhed into the true and the falſe, or ſpurious: they are called true ſutures, when the bones are jointed together in an amazing manner, by means of a multitude of unequal denticulated eminences, forming an appearance ſomewhat like the edge of a

The ſutures.

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* Some take theſe ſpongy parts of the ethmoides for peculiar bones; but they are always continous in adults.

† Adverſar, Anatom. 6. T. 2. fig. 3. qq.

ſaw: theſe denticulations enter mutually into each other's ſinuſes, and are moſt plainly viſible externally: of this kind are thoſe called the coronal, ſagittal, and lambdoidal ſutures. The falſe or ſpurious ſutures, are thoſe ſquammoſe ones of the temporal and parietal bones, and of the os frontis and ſphenoides in the angle, where they unite with the parietal ones.

The common ſutures are, the tranſverſal one, which joins the os frontis with the bones below it; the ſphenoidal, the ethmoidal, and the zygomatick [*]: but theſe are of little moment. Anatomical authors mention the having met with ſkulls, in which there were no ſutures at all [†].

75. Between the ſutures, particularly the lambdoidal and the ſagittal, there are found, in many ſkulls, certain ſmall bones. Theſe are called by ſome oſſa triquetra, from their figure; by others, oſſa Wormiana, tho' they were known to Galen: they are uncertain in their figure and ſituation, and are joined to the others by ſutures. Theſe bones are, by ſome, eſteemed a great medicine in epilepſies [§].

76. The uſe of the ſutures, is, 1. That the dura mater may, in thoſe places, be very firmly joined to the cranium and pericranium. 2. That, in infants, the head may the more eaſily be extended in its growth, from the ſeveral bones being at that period diſunited at theſe places. 3. That

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[*] Some authors mention alſo a number of other common ſutures; ſuch as the naſal, the palatine, the lachrymal, and the like; but theſe more properly belong to the junctures per harmoniam.

[†] See Fallopius de oſſibus, and Meibomius de ſuturis cranii.

[§] Our author preſerved a ſkull in which the lambdoidal ſuture was two fingers broad, and there were more than twenty of theſe diſtinct bones.

the tranſpiration from the brain may be the more free and eaſy, at that time of life in which they are open, and at which alſo the habit is more humid. 4. That very large fractures of the ſkull might be, in ſome meaſure, prevented. And, finally, there is another advantage in their openneſs in children, namely, that medicinal applications to the external part of the head may penetrate, and do ſervice.

77. After the examination of the cranium, we are to deſcend to the maxillæ: by this term we underſtand, the bones of the head not hitherto mentioned, and placed under the anterior part of the cranium, but forming no part of its cavity: the one of theſe is called the maxilla ſuperior, or upper jaw, and is immoveable, adhering firmly to the other bones of the head: the other is called the maxilla inferior, or lower jaw, which is moveable, and contrived for various purpoſes. The maxillæ.

78. The jaws are ſhorter in the human frame than in that of any other animal, in proportion to the ſize of the body; and this is a circumſtance that adds greatly to the beauty of the face.

79. The upper jaw is compoſed of thirteen bones, and has, when the number is complete, ſixteen teeth in it.

80. Of the thirteen bones of the upper jaw, there are twelve in pairs: theſe are, 1. The lachrymal. 2. The naſal. 3. The jugal. 4. The maxillar. 5. The ſpongioſum inferius. And, 6. The palatine. The thirteenth is an odd bone, and is called the vomer.

Many of the anatomical authors do not diſtinguiſh theſe ſix pair of the bones of the upper maxilla by name, but only by number; calling them the firſt, ſecond, third, fourth, fifth, and ſixth pairs: but this may eaſily lead the young ſtudent into confuſion and error. Such appropriated names, for the ſeveral pairs of them, as are here given, are more eaſily retained than numbers: and we are to add, that numbers conveying no idea of the bones themſelves, the name of firſt pair may as well belong to the lachrymal as to the naſal, to one pair as to another; whereas, in this way, they are kept diſtinct, and the name of one cannot be applied to another.

81. Theſe ſeveral bones of the upper maxilla are united to one another by a kind of juncture, which appears equal and even, and is called, by anatomiſts, junctura per harmoniam.

82. The firſt pair are the oſſa lachrymalia, or, as they are called by ſome, oſſa unguis. In theſe, after underſtanding the origin and reaſon of their name, we are to obſerve the ſituation, ſize, and circumference, their connections, [their ſubſtance, which is very tender; the furrow in them, made for the naſal canal; their uſe: and, finally, the operation performed by ſurgeons on this part in the fiſtula lachrymalis.

83. The ſecond pair are the oſſa naſi: in which we are to obſerve the ſituation, circumference, figure, and ſubſtance, their two ſurfaces, their connections, and their uſes.

84. The third pair are the jugale or zygomatick, called alſo by many the oſſa malæ. In theſe we are to enquire into the reaſon of their name, their ſituation, and circumference; their ſubſtance, which is hard; their connection, their four apophyſes, the places where the maſſeter and the zygomatick muſcle have their origin, and the foramina in them, with their uſes.

85. The fourth pair are the maxillary ones: in theſe we are to regard the ſituation, the circumference, the ſize, and the four apophyſes. 1. The

jugale. 2. The upper naſal. 3. The lower naſal, to which the ſeptum of the noſe is joined. And, 4. The palatine *. In theſe we are alſo to obſerve the palatine and naſal excavations, the ſockets or alveoli of the teeth, and the ſinus commonly called antrum Highmorianum †, tho' not very properly named from that anatomiſt, ſince it was evidently known, before his time, to Veſalius and others. The ſize of this is to be regarded, and the conſtruction of the orifice or aperture in living ſubjects: alſo its uſe, which is double, 1ſt, for the aſſiſtance of the voice; 2d, for the ſecretion of a mucous matter. We are alſo to obſerve the naſal canal; and to inform ourſelves of the operation in one of the ſpecies of the ozena, in which this part is concerned.

86. The fifth pair are the oſſa ſpongioſa, or the turbinata inferiora, as others call them: theſe are ſmall, oblong, and friable bones: they adhere to the interior part of the maxillaria in the cavity of the noſtrils. Theſe ſerve to take off the ſharpneſs of the cold air, ruſhing this way into the lungs: they alſo prevent the getting of little inſects, &c. into the fauces; and they increaſe alſo the expanſion of the pituitary membrane, for various purpoſes ‡.

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* Theſe palatine apophyſes have improperly been called, by ſome, peculiar bones, and deſcribed under the name of oſſa palatina antica; but they never are diſtinct and ſeparate from the bones of which they are here made a part.

† See Palfin. Oſteolog. T. 2. fig. 2. Alſo Drake's Anatomy, T. 18. fig. 1, and 2. Morgagni, however, obſerves that theſe ſinuſes are ſometimes wanting, though this is very rarely. Adv. Anat. 6.

‡ Santorini, Obſ. Anat. p. 88. does not allow theſe to be diſtinct bones; but makes them apophyſes only of the bones of the palate: diſſection, however, ſhews that they are really and truly diſtinct.

87. The ſixth pair make the oſſa palati, or bones of the palate. In theſe we are to obſerve the figure, which is very irregular, and their extenſion thro' the noſtrils to the orbits; their body, and their various apophyſes; the pterygoide, the naſal, and the orbital *; the furrow in their upper ſurface, where the vomer is joined to them: and, finally, their uſes, which are, 1ſt, to form the palate, the orbit, and the maxillary ſinus; 2d, to ſuſtain the membrane of the palate and uvula; 3d, to aſſiſt in the modulation of the voice.

88. The laſt or thirteenth bone of the upper jaw, which is ſingle, not pair'd as the others, is called vomer, from ſome reſemblance that it bears, or is ſuppoſed to bear, to the ſhare of a plow. In this we are to obſerve the ſituation, the ſubſtance, which is thick in the upper part, and thin in the lower; the circumference, the double lamella that compoſes it, with the intermediate ſpace; the connections, the ſtructure, and uſe of the ſeptum narium †.

The orbits.

89. Before we have gone thro' the examination of the maxilla ſuperior, there are yet to be obſerved the great cavities, in which are placed the eyes. Theſe are called the orbits, orbitæ; and they are compoſed of a concourſe of ſeven bones: theſe are, 1ſt, the coronal; 2d, the ſphenoidal; 3d, the plane part of the ethmoide; 4th, the jugale; 5th, the maxillar; 6th, the lachrymal; and, 7th, the palatine.

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* See, in regard to this bone, Winſlow in Hiſt. Acad. Reg. Paris, anno 1720.

† Santorini will have this bone to be a part of the ethmoides; but tho' we cannot but allow that it concretes into one body with that bone in adults, yet in young ſubjects it is always perfectly diſtinct.

90. In theſe we are to remark the figure, the large opening, and narrower baſe; the places where the muſcles of the eyes and eyelids have their origination, and where the lachrymal ſacculus, gland and caruncle are placed.

91. The maxilla inferior, or lower jaw, is that large moveable bone of the head which contains the lower ſeries of teeth: on the mobility of this depends, in a great meaſure, the power we have of chewing our food. The lower jaw.

92. In this we are to regard, 1ſt, the bone itſelf; and, 2d, the teeth in it.

93. In the bone or maxilla itſelf, we are to obſerve its number and ſtate in infants, in whom it is compoſed of two bones; its ſize, figure, and ſubſtance, which is externally firm, and internally ſpungy. We are alſo to obſerve its external and internal appearance, and its external and internal margin or edge; its connection, and the place where the two bones, of which it is compoſed in children, unite; its poſterior eminence at the roots of the dentes inciſores, for the inſertion of ſeveral muſcles; the chin, the condyloide apophyſes, cover'd with a moveable cartilage *; as alſo the coronoides, and their uſe; the two angles, with the alveoli, or ſockets of the teeth; and the four foramina, which form two openings, affording a paſſage to the blood-veſſels and nerves. The great uſe of both the jaws is for ſpeaking, and chewing our food.

94. The teeth come next to be conſidered: they are the furniture of both the jaws; and are very hard, bony ſubſtances, fixed in their proper cavities in them, in the manner of nails. This kind of articulation is called gomphoſis. The teeth.

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* See this very accurately delineated by Morgagni, Adverſ. 2. fig. 1, 2, 3.

95. In regard to the teeth, we are to conſider their ſituation in deep ſockets; and their connections, by means of the perioſteum and gums. Their natural colour is white; their number from twenty-eight to thirty-two, fourteen, fifteen, or ſixteen, being placed in each jaw, if the number be perfect. They are divided into, 1ſt, four inciſores; 2d, two canini, or eye-teeth; 3d, eight molares, or grinders, in each; and two dentes ſapientiæ.

We are to obſerve their baſe, which is compoſed of a double ſubſtance, a ſtoney or porcelain-like matter, and a medullary one. Their roots are ſometimes ſimple, as in the inciſores, canini, and the foremoſt of the molares; ſometimes double, triple, or quadruple, as in the hinder molares: finally, we are to obſerve their cavities, which are covered with a vaſculo-nervous membrane*, and the foraminula, or little holes in the roots of them, ſerving for the ingreſs of the veſſels, which afford them nutrition and ſenſation.

We are to enquire into the origin and accretion of the teeth in infants, the change and regeneration of them at about ſeven years old, and ſometimes over again in very old people; and, finally, the collapſing and coaleſcence of the alveoli in old people, after the teeth are fallen out †.

96. There are alſo ſome ſingularities, in regard to the teeth, by no means to be overlooked: ſuch are their ſtanding too diſtant, or their coaleſcing with one another, or with their alveoli in their growth ‡; and, finally, their appearing ſometimes from the palate, or out of their natural place.

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* Deſcribed by Ruyſch in his Theſ. Anat. 1. p. 48.

† See Ruyſch's Obſerv. p. 17. Our author had alſo the ſkull of an old perſon of the ſame kind: in both jaws of it all the teeth were wanting; and the whole alveoli, ſo far as they had touched the teeth, were conſumed and deſtroyed.

‡ Columbus de re Anatomica.

97. The uſes of the teeth are, 1ſt, to break our food; 2d, to be of aſſiſtance to us in ſpeaking; 3d, to add to the beauty of the face.

Foramina of the cranium.

98. The foramina in the cranium are numerous, and their uſes important: they will be the better retained in the memory of the young ſtudent, from our treating of them together.

They are to be divided into external and internal: by the external, we mean thoſe which are eaſieſt diſcovered on the external ſurface of the ſkull: by the internal, thoſe which are moſt obvious in the internal ſurface.

99. Of the larger internal foramina, we count eleven pair affording paſſage to the arteries, veins, and nerves of the brain: and beſide theſe, we are to remark one which is ſingle, namely, the great foramen of the occipital bone, which gives paſſage to the medulla ſpinalis, and with it to the acceſſory ſpinal nerves, and to the vertebral arteries.

100. We are to pay a particular regard to the firſt pair of theſe foramina, (which may, indeed, be more properly called a congeries of the foramina of the os cribroſum:) theſe give paſſage to the filaments of the firſt pair of nerves, called the olfactory nerves. The ſecond pair are in the ſphenoidal bones, and give paſſage to the optic nerves. The third pair are called the unequal and lacerated foramina, and give paſſage to the third and fourth pair of nerves, to the firſt branch of the fifth pair, and to the ſixth pair; as alſo to the emiſſary of the receptacles of the dura mater *. The fourth pair are in the ſphenoidal bone, and give paſſage to the ſecond branch of the fifth pair of nerves, which is diſtributed to the ſeveral parts of the upper jaw. The fifth or oval

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* Santorini Obſ. Anat. p. 75.

foramina, give paſſage to the third branch of the fifth pair, and to the emiſſary of the dura mater *. The ſixth is a very ſmall foramen, and admits an artery, which is diſtributed over the dura mater, and is that which forms the impreſſions of little ſhrubs or trees on the parietal bones. The ſeventh is placed between the ſella equina and petroſe apophyſis, and it tranſmits no veſſels, but is ſhut up by the dura mater. The eighth pair of foramina give paſſage to the carotid arteries, whence it is called the carotic foramen; and the intercoſtal nerve has its egreſs alſo at this opening. Thro' the ninth, which is in the os petroſum, paſſes the auditory nerve: thro' the tenth, which is between the os petroſum and the occipital bone, paſs the par vagum, and the lateral ſinuſes of the dura mater, together with the ſpinal nerve. The eleventh is in the os occipitis, near the edge of the foramen magnum; and thro' this paſs the ninth pair of nerves, called the linguale.

101. Beſide theſe foramina, there alſo are a number of little ones in the os petroſum, often very fairly viſible. One of theſe carries back a branch of the auditory nerve to the dura mater; and the other principal one tranſmits the ſanguiferous veſſels to the labyrinth, or internal organ of hearing.

102. Of the external foramina of the cranium, there are two proper ones of the os frontis, a little above the orbits. Theſe are, from their ſituation, called ſupraorbitalia: they give paſſage to the opthalmick nerve of Willis; but, in their place, we often meet with only a ſuperficial inciſure. Beſide theſe, there are four other foramina, common to the os frontis, and to the plane

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* Santorini Obſ. Anat. p. 75.

or papyraceous bones of the orbit: two of theſe are placed on each ſide, and they tranſmit little nerves and veſſels to the ſinus of the ethmoidal bone.

In the parietal bone, there is one which ſerves for the paſſage of a vein from the cutis of the cranium into the ſagittal ſinus of the dura mater, or from the ſagittal ſinus to the external veins of the head: this, however, is often wanting; and many anatomiſts, therefore, do not mention it.

In each of the oſſa temporum there are three common foramina: the firſt of theſe is the foramen jugale, which ſerves for the paſſage of the crotaphite muſcle: a ſecond is large, in which is the ſinus of the jugular vein; and the third is the ductus euſtachii, already mentioned, ſituated between the petroſum and ſphenoides, and leading from the mouth into the internal ear. Beſide theſe common foramina of the oſſa temporum, there are alſo three proper ones: 1. The meatus auditorius, or auditory paſſage. 2. The aquæduct of Fallopius, ſituate between the maſtoide and ſtyloide proceſs, and tranſmiting the hard portion of the auditory nerve. 3. A foramen behind the maſtoide proceſs, ſerving for the ingreſs of a vein into the lateral ſinus; or for the egreſs of one from the lateral ſinus to the veins of the occiput *.

In the occipital bone there are two foramina, ſituate behind the condyloide apophyſes, and ſerving to give paſſage to the vertebral veins into the lateral ſinuſes of the dura mater; theſe foramina, however, are wanting in many ſkulls.

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* Bartholine obſerves, that Lyſerus was the firſt who obſerved the communication between this ſinus and the external veins.

In the ſphenoides, beſide the internal ones already deſcribed, and the apertures of the ſinuſes into the noſtrils common to them, with the bones of the palate, and which are the apertures of the nares and fauces; there is another canal in the upper part of the pterygoide proceſſes, ſerving for the paſſage of the novum emiſſarium of the dura mater *.

In the os ethmoides there are, 1. Thoſe common to this bone with the os frontis, ſituated in the interior ſide of the orbit, and already deſcribed; and, 2. The apertures of the ethmoidal ſinuſes into the noſtrils.

Foramina of the maxillæ.

103. The foramina in the os maxillaris of the upper jaw, are, 1. One called the foramen palatinum anticum, ſituate behind the foremoſt dentes inciſores, and opening into the noſtrils; but this is uſually ſo cloſed up in living, and even in dead ſubjects, by the membrane of the palate, that nothing of its aperture is diſtinguiſhable within the mouth; nor is it certainly known that any thing is tranſmitted thro' it †. It is alſo to be obſerved, that as the membrane of the mouth is evidently joined to that of the noſtrils, by means of this canal, a very ſufficient uſe of it may be the making the union between that membrane and that of the palate, the more ſtrong.

The ſecond foramen of the maxillaris of the upper jaw, is the infraorbitale. The name of this

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[*] Santorini Obſ. Anat. p. 75.

[†] Moſt of the anatomical writers alledge, that a liquid is tranſmitted from the noſe into the mouth thro' this opening; and hence they uſually call it Steno's paſſage from the noſe to the palate. This, indeed, in a dried ſkull, is obvious and open enough; but, otherwiſe, it is ſo ſmall, that our author alledges, he never could find that it opened into the mouth at all; or ever could paſs a briſtle, or any other the ſmalleſt thing, thro' it.

declares its ſituation. Its uſe is to give paſſage to the fifth pair of nerves.

Thirdly, there are other foramina behind the poſterior molares, thro' which the veſſels and nerves paſs to the maxillary ſinuſes.

Fourthly, there is an inciſure in the exterior ſide of the bottom of the orbit, common to this and to the ſphenoidal bone, and ſerving to give paſſage to the veſſels going to the eyes and noſe.

The fifth is the naſal canal, common to this bone and the os unguis.

The ſixth are the apertures of the ſinuſes into the noſtrils.

And the ſeventh is the poſterior palatine foramen, common to this bone, with that of the palate, and ſerving to convey the nerves to the palate.

In the os jugale there are, 1. The jugale, or common foramen. 2. The proper foramen of the jugale, which is ſometimes ſingle, ſometimes double, and ſerves for the paſſage of a nerve.

In the os palati, beſide the foramen common to that, with the adjoining bone, there is a proper one, ſituate near where it is joined to the pterygoide proceſſes, and ſerving for the paſſage of nerves to the palate.

104. In the maxilla inferior, there are two foramina in the internal ſurface, ſerving for the paſſage of an artery, a vein, and a nerve, into the very ſubſtance of the maxilla, for its nutrition, and that of the teeth; and there are alſo two in its external ſurface, which ſerve to give egreſs to the ſame veſſels, which are thence diſtributed to the gums and the chin.

105. In the examination of different ſkulls, other foramina, beſide theſe, will occaſionally be found in different places. Theſe are either extra-

ordinary, and *luſus naturæ*, as is often the caſe; or they are otherwiſe ſuch as ſerve only to give paſſage to veſſels, ſerving for the nutrition of the bones in which they ſtand.

Os hyoides. 106. There is yet another bone to be mentioned in this place, as it is uſually referred to thoſe of the head: this adheres to the baſe of the tongue, and has hence been called by ſome os linguale; and by others, from its reſemblance to the Greek letter (υ), os hyoides and hypſiloides: others alſo have called it from its ſhape, os bicorne. In young ſubjects the os hyoides is compoſed of three bones, or fruſtæ, a baſe, occupying its middle part, and two lateral ones, called its horns: it is to theſe that the tongue is connected. In adults there are often, at the junctures of theſe with the baſe, two other fruſtæ, very ſmall, and thence overlooked by moſt writers. Theſe are nearly of the ſhape of a wheat-corn, and may thence be called oſſa triticea: there are ligaments affixed to theſe, by means of which they adhere to the ſtyloide proceſſes. And, finally, in theſe ligaments themſelves ſometimes, tho' very rarely, there are found ſome other little bones. Veſalius alſo, occaſionally, had met with ſix of theſe; and ſome others, after him, have reckoned eleven bones to the formation of the os hyoides. The uſe of the os hyoides is to give a firm baſis to the tongue; and ſeveral muſcles of the tongue, and of the larynx, ſerving to the neceſſary motions of both, are inſerted into it.

Bones of the larynx. 107. As four of the cartilages of the larynx are ſubject to oſſify in old people, many have reckoned them among the number of the bones: they are called the thyroide, the cricode, and the two arytænoides. The nature and uſe of theſe parts, however, are much better underſtood when they are examined recent, than when in the ſkeleton; of which, at beſt, they make but an improper part. We ſhall ſay nothing more of them here; but reſerve our account of them to the chapter in which we treat of the lungs: from the bones of the head, we ſhall now proceed to mention thoſe of the trunk.

CHAP. III.

Of the Bones of the Trunk.

108. THE trunk, which makes the ſecond part of the ſkeleton, conſiſts of the ſpine of the back, the bones of the breaſt, and the oſſa innominata.

109. The ſpina dorſi, called by the Greeks rachis, is the boney column reaching from the head down to the anus, and containing the medulla ſpinalis, or ſpinal marrow. Spina dorſi.

110. We ſhall conſider the ſpine firſt in a general view, and afterwards in regard to its ſeveral parts.

111. In the general view of the ſpine, we are firſt to obſerve its name; its figure, which is nearly pyramidal *, and bent ſomewhat like the letter S; and to enquire into the reaſon and uſe of this figure.

112. When we conſider the ſpine, according to its parts, there occurs, firſt, its diviſion into the neck, the back, the loins, and the os ſacrum and coccigis. Vertebræ.

113. The neck, the back, and the loins, conſiſt of vertebræ and ſpondyli; and, in regard to theſe, we ſhall have occaſion to obſerve ſome

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* See, on this ſubject, Winſlow in Act. Reg. Par. 1720.

things in the general, ſome more particularly of the ſeveral parts.

114. In the general conſideration of the vertebræ, we are to obſerve their number, which is twenty-four: and in the examination of them ſingly, there will readily occur in each the body or baſis; ſeven apophyſes, one of them ſpinoſe, two tranſverſe, two ſuperior, two inferior: and after theſe, we are to obſerve the cartilaginous epiphyſes.

The articulation, by which every one receives another of them, and is again received itſelf by another, in the ſame manner: the foramina, of which there is one proper and large one, for the paſſage of the ſpinal marrow; and four common or half foramina, two on each ſide; which, together, form twenty-four apertures on each ſide of the column, thro' which the nerves of the medulla paſs out of the ſpine. Beſide theſe, there are alſo ſeveral ſmaller foramina viſible in the vertebræ, which ſerve for the entrance of veſſels deſtined to the nutrition of the bone.

115. In adults the vertebræ conſiſt each of a ſingle bone; but, in infants, each is compoſed of three fruſtæ: the body, and the two ſides of the bone in theſe, are three diſtinct bones; and the ſpinoſe apophyſes are not found at that time.

116. The neck conſiſts of ſeven vertebræ; and in theſe, as in the others, we are to obſerve ſome things in general; and afterwards, others of the vertebræ in particular.

Vertebræ of the neck.

117. The vertebræ of the neck are ſmaller than thoſe of the back; but they are of a firmer conſiſtence, and harder: their body is more compreſſed than in the others, and is ſinuated on the upper part, and convex below.

Moſt of theſe vertebræ have nine apophyſes; the tranverſe and poſterior ones, called the ſpinoſe apophyſes, are uſually bifurcated: the tranſverſe ones are perforated alſo, for the paſſage of the vertebral veſſels to the head.

The common foramina are ſeven pair, for the paſſage of the nerves of the neck from the medulla.

118. In the conſideration of the vertebræ ſingly, we are to obſerve, that the upper one has a peculiar name: it is called *atlas*. This wants the body and the ſpinoſe apophyſes, and approaches to the figure of a ring: its ſubſtance is more ſolid than that of any other, and it receives both above and below; but it is not received itſelf. The head is articulated at its anterior part, and it is by means of this articulation that the head is bent, and is extended. The proper foramen is greater in this than in any other vertebra, which ariſes from its wanting the body: the tranverſe proceſſes are alſo longer than in the others. It has alſo a peculiar ſemi-circular ligament, by which it embraces the dentiform proceſs of the ſucceeding vertebræ *.

119. The ſecond vertebra is called epiſtrophæus and axis. In this, after underſtanding the name, we are to obſerve the dentiform or odontoide proceſs, juſt mentioned; its articulation in the manner of a hinge, with the firſt vertebra; and the rotatory motion of the head, dependent on it.

120. The third vertebra is alſo called by ſome axis; but it has nothing to warrant ſuch a name: there is nothing of particular obſervation in this, or in any of the ſucceeding vertebræ of the neck, more than has been obſerved of them in general.

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* Veſalius Hum. Corp. fab. l. 1. cap. 15.

121. The part of the ſkeleton diſtinguiſhed by the names of dorſum and thorax, has twelve vertebræ. Of theſe we are to remark, in general, the ſize, which is of a middle kind, between that of the vertebræ of the neck and of thoſe of the loins; the ſpinoſe apophyſes, which are very long, and (except in the two laſt) very much inclinated: the cartilages between the bodies of theſe, are ſmaller than thoſe in the neck, which is intended by nature, to prevent too lax a motion in this part, which would be inconvenient to the breaſt. The tranſverſe apophyſes are thick, and have a depreſſion in them for the articulation with the ribs; for which purpoſe alſo, in the ſides of the two conjoined bodies, there is a ſmall excavated eminence obſervable: there are alſo twelve common foramina on each ſide, ſerving for the egreſs of the twelve pair of nerves of the ſpine.

122. In our conſideration of the ſeveral vertebræ particularly, we are to obſerve, that the firſt is called the axillary, or eminent vertebra; and to this is joined the upper rib. Authors have given peculiar names alſo to the others; but this is without any neceſſary foundation, as they are very well diſtinguiſhed only by numbering them.

Vertebræ of the loins.

123. The vertebræ of the loins are five: we are to obſerve, in general, of theſe, that their bodies, and alſo the intervening cartilages, are very thick; the tranſverſe apophyſes very long, but ſmaller than in thoſe of the back; the ſpinoſe apophyſes are thick, ſtrait, and ſet farther aſunder than in the others, to give way to a laxer motion in this part; and that there are, on each ſide, five common foramina, ſerving to give egreſs to the lumbal nerves.

Some authors have given particular names alſo to each of theſe vertebræ; but it is not at all neceſſary:

ceſſary: they are ſufficiently diſtinguiſhed by numbering them.

124. In the examination of the os ſacrum, we are to obſerve its name, ſituation, and connection; its figure, which is triangular; its external ſurface, which is rough; and its internal one, which is ſmooth and hollow; its ſubſtance, which is ſpongeous; its baſis; its apex; its two large lateral apophyſes, which ſerve for its articulation with the oſſa innominata *; its two ſmaller upper apophyſes, with the glenoide cavities for the articulation into the lower vertebra; its inferior apophyſis, for its articulation with the os coccygis; its canal, for the end of the ſpinal marrow; its anterior and poſterior foramina, which are ſometimes four, ſometimes five pair: and finally, we are to obſerve the difference of this bone in male and in female ſubjects. Os ſacrum.

125. The uſes of this bone are, 1ſt, to ſerve as a baſis to the ſpine; 2d, to form the pelvis with the oſſa innominata, and to defend the parts contained in it; 3d, to contain in its ſinus the lower part of the ſpinal marrow, or cauda equina; 4th, to give paſſage, at its foramina, to the nerves of the inteſtinum rectum, the bladder, and of the parts of generation, and to the large crural and iſchiadick ones: theſe all paſs thro' its anterior foramina: the poſterior ones have either abſolutely nothing, or, at the utmoſt, only nerves ſo minute, as ſcarce to be viſible, paſſing thro' them. 5thly, it ſerves for the place of origin to many of the muſcles.

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* Schelhammer tells us, that himſelf was the firſt who obſerved, that the connection of the os ſacrum with the oſſa innominata was moveable. Analect. diſſ. 6. S. 57.

See more of this articulation, and of the ligaments by which theſe bones are connected, under the head of the Oſſa Innominata.

126. In adults the os ſacrum is one continued bone; but in infants it is almoſt entirely cartilaginous; and in children more grown up, it always conſiſts of ſeveral fruſtæ, or pieces: in adults, it ſhews always the marks of the joinings of four or five of theſe.

Os coccygis. 127. The os coccygis, in adults, is uſually a ſingle bone; but in younger ſubjects, it conſiſts of three or four fruſtæ; and in infants it is merely cartilaginous. In the examination of this bone, we are to remark its name, ſituation, connection, figure, and ſubſtance; its baſe, and its apex; its ſmall tranſverſe apophyſes; its glenoide cavity, where it is joined to the os ſacrum; its motion; its ſtate in female ſubjects; and its uſe in ſupporting the inteſtinum rectum.

128. In quadrupeds of many kinds this bone is long, and compoſed of a number of fruſtæ, and is bent outward, and conſtitutes the tail: in this caſe it is called the os caudæ. In man it is ſhort; and is, to anſwer many purpoſes, bent inward.

CHAP. IV.

Of the Bones of the Thorax.

Thorax. 129. THE ſecond part of the trunk in the ſkeleton is called the thorax, pectus, or breaſt. This is compoſed of thoſe bones which form the great cavity, in which are contained the heart and the lungs.

130. In the conſideration of this part, we are to obſerve, that its ſtructure is partly oſſeous or boney, partly muſcular; and to enquire into the reaſons of it. We are then to attend to its figure, its circumſcription, its ſize; and the three parts

into which it is naturally divided, namely, the vertebræ, the ribs, and the ſternum. The vertebræ we have already ſpoken of in their place. It remains here to mention the ribs and the ſternum.

131. In our examination of the ribs, we are to Ribs. obſerve their ſituation; their ſize, which is very different in the different ones, the middle ones being the largeſt, and the upper and lower much ſmaller; their ſingular bending downwards; their connections; their number, which is twelve on each ſide; their diviſion into the true and ſpurious ribs; and finally, their uſe.

132. The ſubſtance of the ribs is partly boney, partly cartilaginous: the latter ſtructure takes place in their anterior part, the former in their poſterior. Their figure is crooked, concave within, and convex without: they are thus formed for the better conformation of the breaſt.

133. The parts of the ribs are, their body and their extremities. In the examination of the body, we are to obſerve the external and internal ſurface of it; the interior and exterior labrum, and the inferior and ſuperior; as alſo the furrow in the inferior labrum; the ſuperior ones having nine or ten hollows in them, for the reception of the veſſels of the ribs. The ſeveral ribs have been diſtinguiſhed by many authors, each under its peculiar name; but this is not neceſſary: they are as eaſily diſtinguiſhed by the names of firſt, ſecond, &c.

134. In the anterior extremities, the cartilages of the ſeven true ribs are all joined to the ſternum: the eighth, ninth, and ſometimes alſo the tenth, cohere either with the ſternum, or elſe mutually adhere to one another, by means of their tranſverſe cartilages. The anterior extremities

of all the others are looſe and free, between the muſcles of the abdomen and the diaphragm. In the poſterior extremities there are, in moſt of them, two capitulæ, or heads, which are firmly joined to the vertebræ of the back; yet ſo as to form moveable articulations *.

Sternum. 135. In the examination of the ſternum, we are to regard its ſituation; its figure, which is like that of a dagger; and inform ourſelves of its ſtate in infants †. We are to obſerve alſo the number of portions, or fruſtæ, of which it is compoſed in adults; in whom it is, indeed, ſometimes ſingle; but has alſo ſometimes two, ſometimes three pieces concuring to form it. Its ſubſtance is fungous and ſpungy: its upper part is called the manubrium, or handle; and in this there is, on each ſide, a cavity for the articulation of the clavicles. Its middle is narrow, and its lower part is again broad: to this alſo there adheres a cartilage, called, from its figure, cartilago enſiformis, or xiphoides. This is uſually ſingle; ſometimes it is bifurcated, and not unfrequently it is boney throughout; and on each ſide of the ſternum there are ſeven cavities, for the articulations of the ſeven true ribs.

The uſes of the ſternum are, firſt, to form the anterior part of the breaſt; 2d, to ſupport the ribs and the clavicles; 3d, to defend the parts contained in the cavity of the breaſt; 4th, to ſerve for the inſertion of the mediaſtinum, and for the ſuſtaining the heart itſelf, and of ſeveral muſcles.

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* Of the uſe of theſe articulations in reſpiration, ſee Winſlow Act. Reg. Par. 1720.

† In what manner the ſternum is compoſed of ſeveral bones in infants, and furniſhed with abundance of blood-veſſels, ſee Ruyſch Adverſ. Anat. Dec. 2.

136. The extreme part of the trunk is compoſed of two bones, commonly called by the odd name of oſſa innominata. Theſe, tho' ſingle in adults, are, in infants and youths, each compoſed of three perfectly diſtinct bones; each of which has its peculiar name: the upper one is called the ileum; the anterior one, the os pubis, or os pectinis; and the poſterior one, the os iſchium. Theſe are joined by the intervention of a cartilage, as it were, in the middle * of that ſingular cavity called the acetabulum, and continue viſibly diſtinct there to the age of puberty. After this they coaleſce, and form one intire and continuous bone; and that ſo completely and perfectly, that there is not the leaſt veſtige remaining that they ever were ſeparate.

Oſſa innominata, ileum, iſchium, and pubis.

137. The oſſa innominata are joined, on each ſide, in the hinder part, to the os ſacrum, by ligaments and cartilages, and form a very firm and ſtrong, tho' ſomewhat moveable articulation with it; and, with this bone, they form alſo that cavity which is called the pelvis. In the anterior part, the oſſa pubis cohere with one another, by means of a cartilage †; and in this place they ſometimes, in the time of delivery, eſpecially in young women, recede a little from one another, to give way to the egreſs of the fœtus: this ſeldom happens, however, but when the labour is a very difficult and violent one §.

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* It appears hence, how improperly they expreſs themſelves, who ſay that the acetabulum is formed in the iſchium only; for it is evidently a cavity common to three bones.

† Santorini is of opinion, that the conjunction of theſe bones is not by ſynchondroſis, l. c. cap. 11. but this is yet to be determined.

§ Morgagni has quoted paſſages from ſeveral authors, who have obſerved this. Adv. Anat. 3. p. 28.

Beſide the connections of theſe bones, they cohere alſo with the os ſacrum on each ſide, by means of two peculiar and very robuſt ligaments, a finger's breadth broad, and two or three fingers breadth long each *. The upper one of theſe goes off from the poſterior acute apophyſis of the iſchium, to the os ſacrum; the other, or lower one, joins the tubercle of the iſchium to the os ſacrum: but notwithſtanding this ſtrong connection, the os ſacrum, and oſſa ilei, certainly do frequently recede from one another in the time of delivery, eſpecially in difficult labours †.

138. In the oſſa innominata, we are to obſerve the figure, the external and internal ſuperficies, where many muſcles have their origin; the two anterior apophyſes, an upper and a lower; and the two poſterior ones, which are large and acute: between the two latter, there is a large inciſure. The criſta ilei alſo is to be obſerved; and the tubercle, or tuberoſity of the iſchium, which gives origin to a ligament, and to ſeveral muſcles. The foramen in the oſſa pubis is alſo to be remarked: it is the largeſt of all the foramina of the bones. We are alſo to regard the acetabulum, formed for the articulation of the thigh-bone §; in which there is alſo a ſmaller cavity, for the lodgment of a mucilaginous gland; and an inciſure, to facilitate the ingreſs of the veſſels into this gland, and into the ligamentum teres of the thigh ‖. The place of the inſertion

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* As to theſe ligaments, ſee Cowper's Myotamia nova, and Santorini.

† See Parey: lib. 23, c. 13; and Guillemeau Oeuvr. chir. p. 298.

§ Of the veſſels of this part, ſee Ruyſch's Adverſ. Anat. Dec. 2. Obſ. 1.

‖ Andree and Petit had great contentions at Paris, as to the denomiinſertion of this ligament, is alſo to be obſerved; and the ſupercilia are to be examined, and their uſes enquired into.

139. Finally, we are not to paſs over unobſerved, the ſingular difference which nature has eſtabliſhed in theſe parts, between the males and females. In women, all theſe bones, but particularly the oſſa pubis, are ſmaller, and are placed at a greater diſtance, than in men. By this means the cavity of the pelvis is rendered larger in females; and the angle between the oſſa pubis and iſchii, is alſo larger: a ſtructure very favourable, not only to the geſtation of the fœtus, but to its excluſion alſo.

Differences of theſe parts in males and females.

140. The uſes of theſe bones, beſide what have already been mentioned, are, 1. To ſupport and ſuſtain the ſpina dorſi, and indeed all the parts above themſelves. 2. To make a firm and proper juncture of the other parts of the body with the thighs. 3. To ſerve for the place of origin to ſeveral muſcles. 4. To form the cavity of the pelvis, and to defend its contents from external injuries.

CHAP. V.

Of the upper Extremities.

141. THE extremities of the human body are four; two ſuperior, and two inferior: the two ſuperior are the arms and hands; the two inferior, the legs and feet.

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denomination of this ligament, whether it ſhould be called teres or planum. It is certain, that diſſection always ſhews it plane, not rounded; but cuſtom has eſtabliſhed the other name for it.

The arms. 142. Under the term ſuperior extremities, in the ſkeleton, we comprehend the ſcapula, the clavicles, the os humeri, the cubit, and the hand.

The ſcapula. 143. In the examination of the ſcapula, called by the Greeks homoplata, we are to conſider the figure, connection, and ſituation: we are to obſerve the head of the bone, with its glenoide cavity, tho' ſome call it the acetabulum of the ſcapula; its neck; its baſe; its two angles, the ſuperior and inferior; its ſuperior and inferior coſtæ; its anterior ſurface, which lies upon the ribs, and is ſmooth and concave; and its poſterior, which is uneven. After theſe we are to obſerve its ſpine, its creſt, and its acromion; its ſupra and infra ſpinate cavity; its coracoide proceſs, and its two inciſures, the one between the neck and the acromion, the other behind the coracoide proceſs; and the robuſt ligament which joins the acromion and coracoide proceſs, and prevents the laxation of the os humeri upwards:

The uſes of the ſcapula are, 1ſt, to ſuſtain the arms, and join them to the body; 2d, to ſerve for the inſertion of ſeveral muſcles; 3d, to add ſomewhat to the neceſſary defence of the parts contained within the thorax.

The acromion and the coracoide proceſſes, are but cartilages in infants: afterwards they become epiphyſes; and after this, about the age of ſixteen, they are to be perceived ſeparate bones, and ſo to the twentieth year. This is more particularly the caſe of the acromion.

144. In the conſideration of the clavicles, we are to obſerve the number, the tranſverſe ſituation, and the connections with the ſternum and acromium; their figure, which is ſomewhat like that of the letter S; their ſubſtance, which is ſpongy and brittle; their body, which is a fixed

point for the deltoide, maſtoide, pectoral, and ſome other muſcles; and their protuberance for the ſubclavian muſcle; their two extremities, the rounder of which is articulated with the ſternum, and with the firſt rib; and the flatter, which is articulated with the acromion. The uſes of the clavicles are, 1. To keep the arms, that they do not fall too forward upon the breaſt: ſeveral of the motions of the arm are alſo facilitated by this. 2. To ſerve for the place of origin for ſeveral muſcles. 3. For the defence of the great ſubclavian veſſels, which run under them.

Os humeri.

145. In the examination of the os humeri, or os brachii, as it is otherwiſe called, we are to obſerve its ſituation, its articulation, and its ſize: its body, into which a great number of muſcles are inſerted, and which is, in its upper part, thicker and rounder; in its under part, thinner, and ſomewhat compreſſed. After this, we are to obſerve its rough protuberance about the middle, ſerving for the inſertion of the deltoide and pectoral muſcles; its external and internal ſpine, which terminate in two condyles; its remarkably large cavity, containing the marrow; and, finally, its motion, which is evidently the moſt free and extenſive of that, of any bone in the human body.

146. In its upper extremity, we are to obſerve its head and its neck, into which a ligament, and ſeveral muſcles, are inſerted; and its ſulcus, receiving one of the heads of the biceps muſcle.

147. In its inferior extremity, we are to obſerve the figure, and the articulation with the bones of the cubit, by means of three heads and two cavities; its two condyles or tubercles, of which the external affords a fixed point for the extenſors of the carpus, and the internal for the flexors; its two cavities, the anterior and poſterior, which,

in the extenſion and flexion of the cubitus, alternately receive two proceſſes of the ulna.

Cubitus. 148. In the cubitus we are to obſerve, in general, its ſituation, the binary number of the bones it is compoſed of, for the ſake of the more eaſy and varied motion: theſe are the ulna, or cubitus, properly ſo called, and the radius.

We are to obſerve their ſize, their different thickneſs, and their junctures, as well with one another at their extremities, as with the os humeri and the carpus.

And, finally, the robuſt ligament, by which the bodies of both are connected: this ſerves, firſt, for their more firm union; and, ſecondly, for the commodious inſertion of a number of muſcles there.

149. In the ulna, while the hand is diſpoſed in a ſupine poſture, we are to obſerve its interior ſituation, and its length, which is greater than that of the radius; its three angles or ſpines, to the exterior of which the ligament juſt mentioned is fixed; and to the two internal ones, there are affixed ſeveral muſcles. This bone has a motion of flexion and extenſion.

Ulna. 150. In the ſuperior extremity we are to remark, 1ſt, a remarkable depreſſion, called the ſigmoidal or ſemi-lunar cavity, with an eminence in its middle, correſponding to the eminences and cavities of the os humeri; and, 2dly, a ſmall cavity in the external ſide, ſerving for the articulation with the criſta of the radius. We are then to obſerve its two proceſſes, the anterior or coronoide, and the poſterior or anconæus, or olecranum, and their uſes; and, finally, the tubercle, which ſerves for the inſertion of the brachialis internus muſcle, and of the flexor cubiti.

151.

151. In the inferior extremity we are to obſerve the head, which forms a kind of malleolus, in which there is, 1ſt, a cavity of little depth, ſerving for its articulation with the carpus; and, 2dly, a ſmall ſtyloide apophyſis, ſerving to ſtrengthen the articulation juſt mentioned; and, 3dly, a creſt, ſerving for its articulation with the radius.

152. In the radius, we are to obſerve its ſituation, which is exterior; and its length, which is leſs than that of the ulna; its ſpine, to which the ligament already mentioned (148) is affixed; and its motions of pronation and ſupination *. Radius.

153. In its upper extremity, we ſee a head with a glenoide cavity, ſerving for its articulation with the head of the humerus; a creſt, by means of which it is articulated with the ulna; its neck; and, finally, its tubercle, ſerving for the inſertion of the biceps muſcle.

154. In the lower extremity, we find a head thicker, and more angular in its figure, than that of the other, with a very large hollow at the extremity for its articulation with the wriſt: in the interior ſide, there is a cavity formed to give way to the rotation of the creſt of the ulna; and on the exterior ſide is a ſhort apophyſis, but conſiderably thick, which ſerves to ſtrengthen the beforementioned articulation of the carpus: in the poſterior face there are ſome ſlight inciſures, and in theſe are placed tendons of the extenſor muſcles of the fingers, but particularly of that ſerving to the extenſion of the thumb.

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* In quadrupeds, the radius is firmly united with the ulna; as is alſo the fibula with the tibia: they have no occaſion for a power of pronation and ſupination in theſe parts; therefore the mechaniſm of the human arm was unneceſſary to them. Schelham Analect. diſſ. 78.

The hand. 155. After our examination of the bones of the arm, thoſe of the hand offer themſelves to our conſideration. Theſe are divided, by anatomiſts, into thoſe of the carpus, metacarpus, fingers, and the oſſa ſeſamoidea; of each of which in their order.

Carpus. 156. In the carpus we are to conſider ſituation and name, the eight bones of which it is compoſed, their irregular figure, their connection one with another; their back, which is convex, and the oppoſite ſide, which is hollowed for the more commodious paſſage of the tendons and blood-veſſels to the fingers; then the double order in which they are arranged; the firſt, or ſuperior, forms a kind of head for the articulation with the radius; and the inferior forms a cavity for the furniſhing a moveable articulation with the inferior ſeries, which is joined to the bones of the metacarpus *.

The articulation of the bones of the carpus, therefore, is triple: 1ſt, with one another; 2dly, with the bones of the metacarpus †; 3dly, with the cubitus.

Metacarpus. 157. In the metacarpus there are four bones to be examined; and theſe alſo have a triple articulation, 1ſt, with one another; 2dly, with the carpus; and, 3dly, with the fingers. In each of theſe bones, we are to examine the body, and the extremities. In the bodies of theſe bones, we are to obſerve the figure, which is nearly cylindrick; the cavities for the lodgment of the marrow; and their

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* The ſame Schelhammer obſerves, that himſelf was the firſt who obſerved this manifeſt articulation in the carpus.

† Many authors have given peculiar names to all the bones of the carpus; but it is unneceſſary: the names of firſt, ſecond, and third, &c. ſerve the ſame purpoſe, without burthening the memory.

their ſize, which is larger than that of the bones of the fingers.

The gibbous or convex part of theſe bones, conſtitutes the back of the hand; the hollow part, the palm. Their bodies are placed diſtant from one another; and the interſtices between them are filled up with muſcles, called muſculi interoſſei, and ſerving to move the fingers: but tho' their bodies ſtand at a diſtance, their heads are contiguous.

They differ greatly in ſize: that which ſupports the little finger is ſmaller than the reſt; the ſubſequent ones, toward the thumb, become ſenſibly longer all the way, otherwiſe than as in the bones of the fingers. The extremity, joined to the carpus, is of an irregular figure; but that which comes to the bones of the fingers, has round and large heads, which are articulated with the glenoide cavity of the bones of the fingers.

Bones of the fingers.

158. In our obſervations of the bones of the fingers, we are to remark their number, ſituation, and the peculiar names the ſeveral fingers they belong to are called by, are alſo to be remembered, that we may be able to ſpeak properly of the bones of each. Their names are, reckoning from the thumb, 1ſt, pollex; 2d, index; 3d, medius; 4th, annularis; 5th, auricularis. There are in each three bones, which make three phalanges; the upper of which are much larger than the lower. Their exterior ſurface is gibbous, or convex; and their interior is plane, but ſomewhat hollowed, for the convenience of ſeizing and laying hold of things. The firſt phalanx, in the part where they are articulated with the bones of the metacarpus at their heads, have a glenoide cavity, by means of which articulation they have a free motion every way. In the other extremity

there are two heads, with two cavities, joined to the ſecond phalanx, where the motions of flexion and extenſion are all that are poſſible; and the ſame is the caſe between the ſecond phalanx and the third. In the upper extremities of the bones of the ſecond and third phalanx, there is to be obſerved an eminence, placed between two cavities: this has the ſame uſe with the olecranum. The fartheſt extremity of the laſt phalanx, has a point or apex ſomewhat broader than the body.

The thumb.

159. The thumb, conſidered ſeparately, has the bones thicker than thoſe of the fingers: the firſt of theſe agrees, in all reſpects, with the bones of the metacarpus in figure, ſituation, and articulation; but in its motion it is widely different. The articulation of the firſt with the ſecond, and of the ſecond with the third, are like the articulation and motions of the ſecond and third phalanges of the other fingers.

In the bones of the other fingers, nothing worthy particular obſervation occurs, more than has been remarked here. The ſeſamoide bones of the fingers remain to be ſpoken of; but we ſhall treat of theſe more properly hereafter (S. 180.) We are now to proceed to the bones of the legs and feet.

CHAP. VI.

Of the Bones of the lower Extremities.

160. THE lower extremities of the human body, called by the Latins pedes, conſiſt of ſeveral bones; the femur, tibia, patella, pes extremus, and oſſa ſeſamoidea. They ſerve to ſupport the weight of the whole body.

161.

161. The femur is the largeſt and ſtrongeſt bone of the whole human frame. In the examination of it, we are to remark its ſituation and figure, its body, and its extremities, and to enquire into the uſes of each part of it. Femur.

162. In its upper extremity we ſee, 1ſt, a very large head, and in this a cavity, deſtined for the ligament, commonly called the ligamentum rotundum, and ligamentum teres; tho', in reality, it is not round, but flat *. It is by means of this ligament that it is fixed in the acetabulum, and its laxation upwards is prevented. We are to obſerve alſo the place where it adheres to the acetabulum, its oblique ſituation, and its articulation with the acetabulum. 2. Its neck, to which is affixed a robuſt annular ligament †, which contains the head and neck of the bone, as it were, in a capſula, or caſe: we are alſo to remark the progreſs of this neck, which is not ſtrait, but oblique, nearly horizontal, but turning ſomewhat outward: this is the contrivance of nature, for the keeping the thighs aſunder, by means of which we tread the firmer; and by this ſituation of the neck of this bone alſo, ſeveral muſcles have a much more commodious inſertion than could otherwiſe have been poſſible. We are next to remark the ſpongy cavernous ſtructure of this extremity of the bone, by reaſon of which it is liable to fractures, particularly in this part: the apertures for the ingreſs of ſeveral veſſels, are alſo obſervable; and there are two apophyſes, called trochanters, a greater and a leſſer, which ſerve for the inſertion

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* The diſputes about this ligament, are given at large by Andry, in his Examen, p. 77.

† See delineations of theſe in Bourdon, T. 5. fig. 31. Their veſſels are elegantly figured by Ruyſch, Adverſ. Anat. Decad. 2. T. 3.

of the muſcles of the thigh, and which, together with the head, become, before puberty, diſtinct epiphyſes *.

163. In the lower extremity of the femur, we obſerve, 1ſt, two heads, with a cavity between them, for the articulation with the tibia; 2dly, a poſterior cavity, intended to give ſafe paſſage to the veſſels of the tibia; 3dly, an anterior cavity, for the placing of the patella; 4thly, two condyles, or tubercles, placed near the heads, and ſerving for a fixed point to the origin of the muſcles which are to move the foot. In the exterior part of theſe we obſerve a peculiar depreſſion, and often a ſingle ſeſamoide bone; and ſometimes there is alſo found another of theſe, in the other tubercle: this uſually happens, however, only in very old ſubjects †. This whole extremity of the femur is ſeen, quite to the age of puberty, a perfectly diſtinct epiphyſis.

164. In the body of the thigh-bone, we are to obſerve the anterior ſurface, which is convex, and the poſterior, which is ſomewhat concave: The obliquity of this part of the bone is alſo ſingular: its ſtrength and firmneſs are ſurpriſingly great; and we are to remark its ſpine, or, as ſome call it, the linea aſpera, which ſerves for the inſertion of the triceps muſcle; as alſo its great cavity for the containing the marrow.

The uſe of the thigh-bone is to ſupport and ſuſtain the weight of the whole body; and its moveable articulation at the head, gives way to the eaſy motion of the body, while the feet are unmoved.

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* Cheſelden ſpeaks of a very robuſt ligament, diſcovered by Dr. James Douglaſs, in the upper part of the articulation of this bone; but our author does not allow it.

† See theſe delineated, T. 1. fig. 1, 2, 3, 4.

165. The patella, called alſo by ſome rotula, comes next to be examined. In this bone we are to obſerve the ſituation, number, figure, and ſize; its different thickneſs; its anterior ſurface, which is convex; and its poſterior one, which is unequal, having an eminence and two depreſſions. Its ſubſtance is ſpungeous, and conſequently it is brittle: it is connected by tendons and ligaments to the tibia and os femoris *: it has a motion of aſcent and deſcent in the flexion of the tibia. In infants, and even in children, for ſeveral years afterwards, it is merely cartilaginous. Patella.

166. In the tibia, we are to remark the ſituation, and the two bones which are underſtood to form it, viz. that properly and ſtrictly called the tibia, and the fibula: we are to obſerve the different ſize and thickneſs of theſe two bones; and the articulations of each, as well with one another as with the femur and the foot. Tibia.

167. In the tibia, properly and diſtinctively ſo called, we are to remark its ſituation, its body, and its two extremities: in its upper extremity we are to obſerve the thickneſs, the two glenoide cavities for its articulation with the femur, on which there are lodged two moveable ſemi-lunar cartilages †; the eminence that is between theſe, and is, as it were, bifid, ſerving for the inſertion of the nervous and cruciform ligaments, by which it is joined to the femur; and the cavity behind that eminence, in which the mucoſe glandule is lodged. In its anterior face, we are to obſerve the tubercle, to which the extenſores tibiæ, on

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[*] The ligament by which it is connected to the thigh, ſee in Ruyſch, Theſ. Anat. 7. T. 3. fig. 1.

[†] See Morgagni, Adverſ. 2. fig. 4, and 5. Winſlow, in Act. Paris, anno 1719, who has ſpoke very juſtly of their mechanical diſpoſition and uſe, &c. Cant. T. 5. fig. 4.

which the patella ſtands, are inſerted; and at its ſides two tubercles, affording fixed points to ſome of the muſcles of the foot, and to the exterior of which the fibula is firmly connected; but that in ſuch a manner, as to have nothing to do with the articulation with the femur, as it does not touch that bone.

168. In the lower extremity of the tibia, we are to remark an excavation, formed for its articulation with the tarſus; and, in its exterior ſide, another for its articulation with the fibula; and alſo on its internal ſide, a thick and robuſt apophyſis, called the internal malleolus, and ſerving for the firmer articulation of the foot.

169. In its body we are to obſerve three angles or ſpines, to the exterior of which the ligamentum interoſſeum is connected, which joins the fibula to it: the anterior angle is the moſt acute, and is indeed covered only by the ſkin and perioſteum, whence there is often extremely violent pain attending its contuſions. Theſe angles ſcarce appear at all in infants. Finally, we are to obſerve that this bone has a large cavity for the marrow.

Fibula. 170. In the fibula, which is called alſo perone, we are to remark the ſituation, the juncture, the length, and the ſmallneſs of it: its upper extremity, which does not reach to the os femoris, but is only joined to the external ſide of the tibia; and its lower extremity, called the malleolus externus, which concurs to the articulation with the tarſus: its eminence gives a ſtrength to that articulation, and renders a luxation of it leſs eaſy.

Its body is nearly of a triangular figure, and ſtands diſtant from the tibia: the ligamentum interoſſeum is annexed to its acute ſpine; and this, as well as the whole body of the fibula, ſerves for the commodious inſertion of ſeveral of the muſcles of the foot. The fibula ſolely follows the motion of the tibia: it has no peculiar motion of its own.

171. In our examination of the foot, we are to conſider its length, which is greater in man than in any other animal, and ſerves for his firmer treading; and its ſituation: its upper part, or back, and its under part, or ſoal, called the planta, which is contrived hollow, leſt the veſſels ſhould be preſſed upon in walking, as we preſs with our whole weight there, while in this poſture: finally, we are to obſerve its diviſion into the tarſus, metatarſus, toes, and oſſa ſeſamoidea. The foot.

172. In the tarſus, we are to obſerve the ſituation and the number of the bones, which are ſeven, namely, the aſtragalus, the calcaneum, the os naviculare, the os cuboides, and the three oſſa cuneiformia; their irregular figure, their articulations with the tibia, with one another, and with the bones of the metatarſus, and their connections by very ſtrong ligaments. The tarſus.

173. In the aſtragalus, called alſo the talus, we are particularly to obſerve its ſituation, its figure, articulation with the tibia and fibula, and with the calcaneum, and its head, formed for the articulation with the os naviculare.

174. In the calcaneum, or os calcis, we are to obſerve the ſituation and ſize; the articulation with the aſtragalus and os cuboides; its apophyſis behind, which ſerves to prevent our falling backward, and on the poſterior ſurface of which is inſerted the tendo Achillis, which is the ſtrongeſt tendon of the whole body: in its interior ſide there is an excavation, intended to give ſafe paſſage to the veſſels running to the metatarſus and toes.

175. In the os naviculare, or os ſcaphoides, we are to obſerve the ſituation, the articulation, the glenoide cavity for its articulation with the head of the aſtragalus, and its three anterior faces, which receive the oſſa cuneiformia.

176. In the os cuboides, we are to remark the ſituation, which is in the external ſide of the tarſus, where it receives the outer bone of the metatarſus, which is articulated with the little toe; and the bone of the metatarſus, which is next to it: after this, we are to obſerve its articulations with the neighbouring bones; and the inciſure in the lower part, in which there is often a ſeſamoide bone in the tendon of the muſculus peronæus poſticus.

177. In the three oſſa cuneiformia, the ſituation, their different ſize, and their articulations with the os naviſculare, and with three of the bones of the metatarſus, viz. thoſe which ſupport the great toe, the ſecond, and the third.

Metatarſus. 178. In the examination of the metatarſus, we are to remark the ſituation, and the five bones, the bodies of which are nearly cylindrick, but convex above, and concave below; their interſtices, which ſerve for the placing of the muſcles; their poſterior heads, which are joined with the tarſus, and are unequal; and their anterior ones, which are round, and ſerve for the articulations with the toes: theſe ſtand out a conſiderable way, and by this means give great power to the muſcles, ſerving to move the toes. We are to remark alſo the different ſize of theſe bones; the large apophyſis in the poſterior head of the fifth or outer bone, on which the foot, and in conſequence a great part of the weight of the body, reſts.

Bones of the toes. 179. In the bones of the toes there is a great reſemblance to thoſe of the fingers. They are generally but thirteen in adults, tho' ſometimes they are fourteen; much ſmaller and ſlenderer, except that of the great toe, than thoſe of the fingers. They have not nearly ſo free a motion as thoſe of the fingers. The bone of the great toe is the largeſt, tho' it have only two joints: the others are gradually ſmaller, all the way to the little toe; which is not the caſe in the bones of the fingers. The bone of the little toe uſually, and often that of the toe which is next it, have, in old ſubjects, only two bones; the two extreme phalanges often growing together in old age, and forming only one continued bone: whence we find, in this caſe, a ſtill ſmaller number than the thirteen before mentioned.

Oſſa ſeſamoidea.

180. There remain now to be conſidered, the oſſa ſeſamoidea. Theſe are ſmall bones, and are moſt conſpicuous in old ſubjects: they ſomewhat reſemble the ſeeds of the ſeſamum, whence they have their name. Their moſt uſual ſituation is, 1ſt, in the thumb, and great toe: in each of which we often find two of them, though not unfrequently only one. 2. One in the juncture of the metacarpus with the little finger: this is frequently lodged in the abductor muſcle of this finger *. 3. One frequently in each external condyle of the os femoris †. 4. One under the os cuboides of the tarſus, in the tendon of the peronæus poſtius.

Theſe are uſually found in adults, or in elderly people: ſometimes, tho' more rarely, there is one alſo in the internal condyle of the os femoris: and ſometimes there is one in the external ſurface of the os metacarpi, which ſuſtains the fore-finger, lodged in the tendon of the adductor

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* See its figure and ſituation, tab. 1. fig. 5.

† Tab. 1. fig. 2, 3, 4.

ductor muſcle of the index; and often, in the thumbs, there is one wanting. Upon the whole, there are very rarely found more than ſixteen of them, often fewer. Thoſe anatomiſts, therefore, err greatly, who reckon more than forty of them, placing two at the articulation of each finger and toe: too many, however, have given into this error.

All theſe bones, except thoſe that are found in the condyles of the femur, adhere to the tendons of the muſcles: thoſe excepted, are connected to the origin of the muſcles. Their ſize and ſhape are various and irregular: they are cartilaginous in young ſubjects, but they grow hard and boney by age; and 'tis therefore that they are ſo much the more eaſily found in old people. They ſerve as a kind of trochleæ to the muſcles, and increaſe their power.

CHAP. VII.

Of the number of the Bones.

The number of the bones.

181. HAVING thus gone thro' the enumeration of all the bones of the human body, it will be no great difficulty to inform ourſelves of their true number, tho' authors have not a little varied upon this ſubject. In old people, we find, at the utmoſt, two hundred and ſixty. In young ſubjects we find a greater number, but a very uncertain one; becauſe ſeveral of thoſe, which are at firſt diſtinct and ſeparate, by degrees grow into one.

The

The bones of the head are in number ſixty-nine: of theſe, there are in the cranium, including the ſix oſſicula auditus,	14
In the maxilla ſuperior, or upper jaw,	13
In the maxilla inferior, or lower jaw,	1
The teeth in the two jaws, are	32
In the os hyoides there are properly	5
In the larynx	4
In the trunk there are fifty-three bones, viz.	
The vertebræ,	24
The ribs,	24
The ſternum, when not compoſed of two fruſta,	1
The os ſacrum,	1
The os coccygis,	1
The oſſa innominata,	2
In the extremities there are, in the whole, thirty-eight bones, viz.	
The ſcapulæ,	2
The clavicles,	2
The oſſa humeri,	2
The oſſa ulnæ,	2
The oſſa radii,	2
The bones of the carpus, of which there are eight in each hand,	16
The bones of the metacarpus, four in each hand,	8
The bones of the fingers, fifteen to each hand,	30
The oſſa femoris,	2
The oſſa tibiæ,	2
The oſſa fibulæ,	2
The rotulæ, or patellæ,	2
The bones in the tarſus of both feet,	14
The bones of the metatarſus,	10
The bones of the toes,	26
The oſſa ſeſamoidea, which are rarely more than	16
Therefore the whole number of the bones in a human body is uſually	260

182. The epiphyſes, (S. 51.) in ſubjects arrived at the age of puberty, are about one hundred and twenty-four: if theſe be added to the two hundred and ſixty bones already enumerated, we increaſe the number to three hundred and eighty-four, which is the true number, as nearly as can be determined, of the bones and epiphyſes; both which are often reckoned up, under the general name of bones in the human body.

CHAP. VIII.

Of the Junctures, or Articulations of the Bones.

Junctures of the bones.

183. NOTHING can be more neceſſary to the ſurgeon, than a perfect acquaintance with the junctures of the bones. Anatomical writers have generally given this, therefore, the firſt place in their oſteological part: but it appears much more rational to make it the laſt article on this ſubject; ſince, when the bones themſelves are firſt known, their articulations are much the more eaſily underſtood.

184. The Greek writers have given names, in that language, to the ſeveral articulations, expreſſing their nature or eſſential character; but the later anatomical writers have varied greatly in their explication of them, and too many of them have written very confuſedly on the ſubject. On conſulting Hippocrates and Galen carefully, it will appear, that the following explication is not repugnant to what they have eſtabliſhed on this head.

185. Syntheſis, or ſyntaxis oſſium, called by the Latins conjunctio, expreſſes, according to theſe authors, the junctures of bones of all kinds, whether with or without motion. This large

term comprehends two diſtinct genera of junctures, the arthron, and the ſymphyſis.

Arthron expreſſes an articulation, or juncture: under this come into conſideration the contact of two bones, or the figure of their conjunction, without reſpect to their connection: of this there are two kinds.

1. The diarthroſis, in which there is a manifeſt motion, and which comprehends,
   1. The enarthroſis, in which the head of one of the bones is received into a deep cavity in the other, as in the articulation of the femur.
   2. The arthrodia, in which the head of one of the bones is received into a ſlighter cavity in the other, as in the juncture of the os humeri with the ſcapula.
   3. The ginglymus, in which the bones mutually receive and are received by one another, as is the caſe in the articulation of the humerus and cubitus.

   To theſe Fallopius adds the trochoides, in which the motion is like that of a wheel about its axis, as is the caſe of the articulation of the firſt vertebra of the neck with the ſecond.

   And to all theſe, ſome of the modern anatomiſts have added alſo the amphiarthroſis, a term under which they comprehend all thoſe junctures of bones which have a manifeſt motion, and which differ from the ſeveral articulations now deſcribed, either in regard to their figure, or the motion they allow of.

The ſecond kind of the articulations expreſſed by the general term arthron, is the *ſynarthroſis*: in this there is either,

1. An obſcure motion, as in the bones of the carpus and metacarpus, tarſus and metatarſus. Or,
2. No motion at all, as in the ſutures, gomphoſes, and junctures per harmoniam.

The ſecond general diviſion of the junctures of the bones, uſed in contradiſtinction to the arthron, is the

Symphyſis, or, as the Latins expreſs it, unio. This indicates a connection of the bones, and is effected either,

1. Without a medium, or the addition of any intermediate ſubſtance different from the bones, at leaſt in adults; as is the caſe in the junctures of the os frontis, the maxilla ſuperior, the oſſa innominata, the vertebræ, &c.
2. By the intervention of a medium, or by the addition of a ſubſtance different from the bones themſelves. Of this diviſion there are three ſpecies, and each with or without motion.
    1. The ſynchondroſis, which is ſeen in the oſſa pubis, vertebræ, &c.
    2. The ſynneuroſis, which is ſeen in all the junctures of the limbs, in the ſutures of the cranium, &c.
    3. The ſyſarchoſis, as in the ſcapula, os lingualis, the gums, &c.

CHAP.

CHAP. IX.

Of parts appertaining to the bones; the perioſteum, marrow, ligaments, and cartilages.

Perioſteum.

186. THE perioſteum is a nervous, vaſculous membrane *, endued with a very quick ſenſe; immediately ſurrounding, in every part, both the internal and external ſurfaces of all the bones in the body; excepting only ſo much of the teeth as ſtand above the gums, and the peculiar places on the bones in which the muſcles are inſerted. It is hence divided into the external and the internal perioſteum; and where it externally ſurrounds the bones of the ſkull, it is generally called the pericranium.

187. This membrane ſerves to conſtitute the firſt rudiments of the bones in a fœtus *in utero*: it is the organ of ſecretion for the boney matter, as the membrana adipoſa is for the fat; all the bones, during the time of their growth, receiving from it their matter of accretion, and afterwards their nutriment. The blood-veſſels of the perioſteum penetrate, in innumerable places, into the bones themſelves; as is evidently ſeen in the freſh bones of children.

The ſenſibility in the bones is wholly owing to this membrane; for, when diveſted of this, they may be ſawed, cut, or burnt without pain. It gives alſo the determination and figure to the bones; as is evident from this, that, when it is wounded, exoſtoſes, tophi, and caries ariſe in the part.

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* Ruyſch has very elegantly figured theſe numerous veſſels.

The perioſteum is of different thickneſſes in different parts; but, in general, the internal is vaſtly thinner than the external, and ſerves to nouriſh that part of the bones. It receives alſo nerves and blood-veſſels from the outſide, thro' certain canals in the ſubſtance of the bones, which it communicates to the marrow, in ſuch as have any.

It is generally ſaid to ariſe from the dura mater of the brain; but this is ſcarce right, as it is evidently formed at the ſame time with it in the fœtus.

The marrow.

188. The medulla, or marrow of the bones, which anatomiſts of many ages ſuppoſed to be a mere ſhapeleſs and irregular maſs of matter, is found, in reality, to conſiſt of a fine ſubtile, fat, oleaginous ſubſtance; and of a number of minute veſicles, of a membranaceous ſtructure, in which it is ſecreted from the arterial blood, in the ſame manner as the fat of the reſt of the body. It is contained, in a greater or leſſer quantity, in the cavities of moſt of the cylindrick bones: in the cavernous ones there is not properly any marrow, but a kind of red, fatty, medullary juice. The medullary veſſels, found running here and there thro' their appropriated canals, penetrate into the inner cavity of the bones, and ſecrete the medullary matter from the blood there: the blood being afterwards returned again by the veins. The nerves are diſtributed to the ſame places, for the ſake of ſenſe and motion *. It has been a common opinion, that the marrow increaſed and decreaſed in quantity, according to the increaſe and decreaſe of the moon; but this is idle and erroneous. It

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* See the experiments of Du Verney, in the memoirs of the French academy, 1700.

does, indeed, increaſe or decreaſe in its ſeveral cavities, according to the exerciſe or reſt of the animal, or to its eating more or leſs, or better or worſe food. This ſubtile oleaginous ſubſtance penetrates in between the fibres of the bones, and preſerves them from dryneſs, and from that brittleneſs which would be the conſequence of it; but it does not nouriſh them, as was originally believed.

Ligaments. 189. The ligaments are robuſt and ſtrong cords, as it were, of a membranaceous ſubſtance in general: they ſurround the moveable articulations in form of a ring, and connect them together: they are very firmly fixed to the necks of the bones. Some of them alſo are cartilaginous, nervous, or tendinous, and ſerve to faſten the bones together in the articulation: theſe are uſually round.

There are, however, ſome ligaments alſo which do not connect the bones: theſe are always underſtood to be membranaceous parts, connecting certain other parts together: ſuch are the ligaments of the tongue, of the uterus, of the penis, and of the muſcles. Of all theſe we ſhall ſpeak in their place.

Cartilages. 190. Finally, to the bones belong alſo the cartilages: theſe, as already obſerved, are parts of the body very much emulating the appearance of bones, and are elaſtick; but they uſually have either nothing or very little of any medullary ſubſtance in them.

191. The cartilages are ſurrounded with their perichondrium, as the bones are with their perioſteum. They ſerve to ſeveral purpoſes, 1. For the joining the bones, as in the vertebræ. 2. For the forming the cavities of the articulations. And,

3.

3. For the covering of the extremities of the bones, and rendering them ſmooth and even, where there is required the means of motion. 4. They alſo ſerve for the formation of ſeveral of the other parts; as the aſpera arteria, larynx, bronchia, noſtrils, ears, and edges of the eyelids: of all which in their places.

A COMPENDIUM OF ANATOMY.

BOOK III.

Of SARCOLOGY.

CHAP. I.

Of the common teguments of the human body.

192. WE have hitherto been treating of the bones, which we have underſtood as the ſupports of the human frame; and have gone thro' the examination of the parts belonging to them. We are now to proceed to the conſideration of the ſofter parts of the body, and enter on that branch of anatomy called Sarcology.

193. Sarcology may be divided into ſix parts. 1. The doctrine of the teguments, or common coverings of the ſeveral parts of the body. 2. Splanchnology. 3. Angiology. 4. Neurology. 5. Myology. And, 6. Adenology.

194. In ſplanchnology we are to conſider, 1ſt, the viſcera of the abdomen or chylopœa: theſe

are deſtined to the offices of digeſting our food, &c. and are the ſtomach, the inteſtines, the liver, the ſpleen, and the pancreas. 2. The uropœa, or ſuch as ſerve for the ſecretion of the urine: theſe are the kidneys, the ureters, the urinary bladder, and the urethra. 3. The parts deſtined to generation. 4. The organs of reſpiration, and of the circulation of the blood, which are diſtributed in the neck and breaſt, and are the lungs, the heart, the diaphragm, and the parts belonging to them. And finally, the brain and organs of ſenſe, depoſited in the head.

195. Before we proceed to the examination of the interior ſoft parts, we are to conſider the common teguments ſurrounding the whole body. In the brutes theſe are more numerous; but in man they are only three: they are, 1ſt, the cuticle; 2d, the ſkin; and, 3d, the fat; the cuticula, the cutis, and the pinguedo, or the membrana adipoſa. Theſe, and the reſt of the parts of this diviſion, we ſhall lay down our obſervations on in form of tables, that the young diſſecter may have, as it were, at one view, before him, every thing that he is to remark in every part of the body.

196. The cuticle is a thin membrane, cloſely lying upon the whole ſkin, or cutis, of which it ſeems a part: it is called alſo by a Greek name, Epidermis. In this we are to obſerve,

Its adheſion to the cutis, which is very firm, and is aſſiſted by the intervention of the corpus reticulare of Malpighi; inſomuch that, in diſſections, it cannot be ſeparated from the ſkin by the knife; but this is to be done by means of warm water. In living ſubjects we alſo ſee it ſeparate from the cutis in burns, and by means of bliſters.

The colour is white in the Europeans, black in many other nations.

We are next to remark its ſtructure and ſubſtance: it is compoſed of a multitude of very minute lamellæ, or ſquammulæ, which adhere firmly together, and are eaſily diſtinguiſhed by the microſcope. In theſe there are very numerous foraminula, or apertures, which give paſſage to the hairs, to tranſpiration, and to the ſweat: theſe laſt are generally called pores of the ſkin. Some authors ſay there are valves to theſe, for the preventing the too copious effuſion of the ſweat; but it is more probable, that this is done by the elaſtick power of theſe veſſels.

The thickneſs of the cuticle is very different in the different parts of the body: it is greateſt in the ſoals of the feet, and in the palms of the hands: in other places, in general, it is very thin.

Beſide the pores and foraminula of the cuticle, there are a number of ſulci, or lineæ, furrows or lines, called by Pliny inciſuræ. Theſe are ſome deeper, ſome ſlighter, and are viſible in every part; but no where ſo plainly as in the palms of the hands: on the tops of the fingers they are ſpiral; and they ſeem to be intended for the defence of the excretory ducts of the cutis, which are arranged in this part in a regular order. The regeneration of the cuticle, in a living ſubject, is eaſy: but its origin is not, as was ſuppoſed by the earlier writers, from a condenſation of the exhalations of the body by the external air; but rather, according to Lewenhoeck, from an expanſion of the nervous papillæ of it, which form a multitude of ſmall ſquammulæ, or lamellæ, cohering one with another; or, poſſibly, from both theſe cauſes together.

Even Ruyſch failed in his attempt to find blood-veſſels in the cuticle; neither has any body, ſince his time, been able to diſtinguiſh any there.

From the abſence of theſe it is, that it is without ſenſation, and that no blood flows from it, when cut; but it is certain, that it is nouriſhed and regenerated by a ſubtile fluid of ſome kind.

The uſe of the cuticle is to defend the cutis from injuries, from coming into contact with every thing, from dryneſs, and from pain; and, 2dly, to aſſiſt, and, at the ſame time, to moderate the ſenſe of feeling.

197. The corpus reticulare of Malpighi, or the reticulum cutaneum, is a very fine membrane, perforated, in the manner of a net, with a multitude of foramina. It is placed immediately under the cuticle; and where that is ſeparated from the cutis, whether by art or by accident, this adheres very firmly to it, and is ſcarce poſſible to be parted from it, ſeeming rather to be its inner ſuperficies than a diſtinct ſubſtance. In regard to this, we are to obſerve, firſt, the places in which it is found, which are all thoſe in which the ſenſe of feeling is the moſt acute; as in the palms of the hands, at the extremities of the fingers, and on the ſoals of the feet. The tongue, however, is the part where it is moſt accurately to be obſerved: it is more eaſily diſtinguiſhable there than in any other part; and its nature and ſtructure are moſt evidently ſeen there.

Its colour, in the Europeans, is white; but in the negroes, and other black nations, it is black: in the tawny, it is yellowiſh. The ſkin itſelf, in both, is white; and the blackneſs and yellowneſs depend altogether on the colour of this membrane *.

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* See Ruyſch's obſervations on this ſubject, Adverſar. Anat. Dec. 3. p. 26. This accurate anatomiſt ſeparated the cuticle from the cutis in a piece of the ſkin of a negroe, and found

The uſes of the corpus reticulare, are to preſerve the ſtructure of the other parts of the integuments, and keep them in their determinate form and ſituation. Its apertures give paſſage to the hairs, and let thro' the papillæ, and excretory ducts of the ſkin: it retains theſe in a certain and determinate order, that they cannot be removed out of their places; and has ſome ſhare in preſerving the ſoftneſs of the papillæ, which renders them fit for the ſenſe of feeling.

198. The cutis is a robuſt membrane, as thick as a piece of ſtrong leather, and is extended over the ſurface of the whole body. In this we are to conſider the connection, which is double; its upper ſurface, adhering to the corpus reticulare, and the cuticula, and its under ſurface to the fat. In ſome places this connection is but lax, in others it is very firm. The cutis.

The thickneſs of the cutis is very different in the ſeveral parts of the body; and as different in the ſkins of different animals, as appears from the leather made from it for common purpoſes. It has a multitude of ſulci, or lines, which are common to it with the cuticle. It has foramina of two kinds in it: the larger, ſuch as thoſe of the mouth,

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the cutis itſelf to be white, as in the Europeans; but the exterior ſuperficies of the ſeparated part of the cuticle was blackiſh; and its interior ſurface, where the corpus reticulare came in view, of a deep black. It is evident, from this, that the ſeat of the blackneſs in the ſkins of theſe people, is neither in the cuticle nor cutis, but in the corpus reticulare. Santorini obſerves the ſame thing in his Obſ. Anat. p. 3. He ſays, that the colour of the ſkins of the Europeans, is owing to that of the bile; that it is yellow in the jaundice, black in its laſt ſtages, and of a dead whitiſh in the chloroſis, becauſe the bile itſelf is of theſe ſeveral colours in theſe diſeaſes. Malpighi de Tactus Organo, and Ruyſch, who has greatly improved upon his obſervations, are to be looked carefully into on this head. See Ruyſch's Epiſt. prim. fig. 4, 5, 6, 7.

mouth, noſe, ears, and the like; tho', in propriety, the cutis may rather be ſaid to be reflected than perforated in theſe parts; and the ſmaller, called *pores:* theſe again are of different ſizes, ſome larger, ſome ſmaller, and ſerve to give paſſage to the hairs, to the tranſpiration, and to the ſweat. The pores are very large in the noſe, where the naked eye may evidently perceive them: the ſmaller ones are diſtinguiſhable by the help of microſcopes; and the paſſage of quickſilver thro' leather, ſhews them alſo.

We are to examine the ſubſtance and ſtructure alſo of the cutis, and ſhall find it compoſed of a multitude of tendinous fibres, ſingle, tenacious, and interwoven in a ſurpriſing manner together; of a vaſt number of blood-veſſels, firſt ſhewn by Ruyſch in his preparations, and deſcribed at large in his works: and, laſtly, of a great number of nerves, which conſtitute the pyramidal papillæ, and raiſe themſelves thro' the pores of the corpus reticulare. Theſe, when the cuticle is taken off, are very eaſily diſtinguiſhable in the palms of the hands, and under the ſoals of the feet; as alſo at the ends of the fingers, where they conſtitute the primary organ of feeling *.

After theſe we are to obſerve the cutaneous miliary glands: theſe are ſaid to be very numerous; and are allowed, ſince the days of Steno and Malpighi, by all the anatomical writers, to be found in every part of the cutis, and to ſerve for the excretion of the matter of perſpiration. We are to obſerve that theſe, however, are not ſo eaſily demonſtrated as ſpoken of: few of thoſe, who have treated moſt largely of them, have been able to ſhew many of them; and the office aſſigned to them may as well be performed by the little arteries of the cutis, without any farther aſſiſtance *.

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* See Ruyſch, Epiſt. T. 17. fig. 2. and his Adverſar. Anat. Dec. 2. T. 1. fig. 3.

Finally, we are to remark the folliculi, or receptacula cutanea; which are probably what have been deſcribed by others, under the name of ſebaceous glands †.

The uſes of the ſkin are numerous: 1ſt, to ſurround, cover, and defend the parts that lie underneath it. 2d, To be the organ of feeling. 3d, To be an univerſal emunctory to the body, cleanſing the blood of its redundancies, by the means of ſweat and perſpiration; while theſe, at the ſame time, ſerve to prevent the aridity of the cutis itſelf.

The hair.

199. After the examination of the ſkin, we are to ſpeak of the hair, which is uſually reckoned among the parts of it. When they grow on the body, they are called pili; when on the head, capilli: the laſt are moſt proper for examination. That part of them which is without the ſkin, appears cylindrick to the naked eye; but, when examined by the help of glaſſes, it is found to be unequal and irregular, and often knotty. It is pellucid, but is not hollow; but the extremities of them are often ſplit into ſeveral parts, ſo as to reſemble a pencil.

The part of the hair, that is within the ſkin, is called the root of it; and, from its roundiſh figure, the bulb. This part is hollow and vaſculous, in the manner of the baſes of the young feathers on birds: this vaſculous part is incloſed in a follicle or caſe, and is moſt conveniently to be examined in the large hairs of a cat's whiſkers, or of the beards of other animals.

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* Ruyſch, Dec. 1. p. 9.

† Ruyſch, ibid.

§ See Lewenhoek, Act. Erudit. 1683, p. 511.

The origin of the hairs is in the cutis, and in the fat that lies underneath it[*]; and probably from nerves, as there is a very acute pain felt in pulling them off[†].

The nutritious matter of the hairs is probably the ſame with that of the other parts of the body; not merely excrementitious, as the old authors have ſuppoſed. It is a common aſſertion, that the hairs grow after the perſon is dead; but unqueſtionable experiments prove this to be of the number of vulgar errors, not at all the more true for being univerſally received as truth[‡].

The colour of the hair is very different in the different people of the ſame country; but there are alſo general differences of it, peculiar, in a manner, to the climates. In the hotteſt countries it is very black; in the more temperate ones, it is brown, or of a leſs deep black; in the colder, it is yellowiſh, rediſh, or brown: but, in all places, it grows grey or white with age; and in the labourers in copper mines, and others, who are continually receiving the effluvia of that metal, it becomes greeniſh.

The length of the hair is, in the individual, very different. It is always much longer on the head than elſewhere. In general, it is ſhort and curled under the torrid zone, and gradually longer in the more temperate climates.

Its conſiſtence, to the touch, alſo varies greatly. 1. In regard to the different climates and ſubjects. In general, it is harſher in the Æthiopian than in the European; and harder and dryer in adults than in infants, whoſe habit abounds more with humidities. 2. In regard to the parts of the body on which it grows: it is very harſh and hard under the arm-pits, and about the pudenda: on the head it is much ſofter; and on all other parts of the body it is greatly ſofter than there, and very ſhort.

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[*] Chirac. Suppl. 2. Act. Erudit. T. 8.

[†] See Ruyſch, Epiſt. 1.

[‡] See Ruyſch, Theſaur. Anat. 10. p. 5.

[‡] See Ruyſch, Adverſar. Anat. Decad. 2. p. 46.

As to the time of the origination of the hair, that of ſome parts of the body is of the ſame date with the parts it grows on; ſuch is that of the head, the eye-laſhes, and eye-brows. That of others begins to grow only at a certain time; ſuch is that of the beard, of the arm-pits, and of the pudenda: and in the ſame manner ſome of the hair continues always increaſing in length, while other parts of it never grow after the birth of the infant.

The uſe of the hair of the head is to keep that part warm, as well as to be an ornament to it: that of the reſt of the hair, except only that of the eye-brows and eye-laſhes, is not ſo eaſily determined.

200. After the hair, we are to obſerve the nails. The number, ſituation, figure, ſize, and colour of theſe, need no explanation: but we are to obſerve, that the ſeveral parts of the nail have their ſeveral names. 1. The extremity is called the apex; the oppoſite part to this is the root or baſe: the firſt of theſe is thin and tender; the latter more thick and firm. And, finally, near the baſe there is a white part, called the lunula, from its figure, ſomewhat reſembling a ſegment of a circle.

As to the ſubſtance of the nails, they are compoſed of the cutaneous papillæ, elongated and indurated, and firmly connected to one another in a longitudinal direction; for this reaſon, they are very ſenſible at the roots, where theſe papillæ are yet tender: but at the apex, where they are perfectly indurated, they may be cut without pain.

The papillæ, of which the nails are formed, ariſe out of the ſkin, not only at the root of the nail, but all over the greater part of its under ſurface. It is by this means that the nails are ſo firmly connected to the ſkin; and it is owing to the continual acceſſion of more and more papillæ, as they approach toward the apex, that they become harder and firmer in that part. They may be eaſily ſeparated intire, from dead ſubjects, by hot water.

We are next to enquire into the manner of their nutrition. As the reſt of the papillæ of the cutis have their veſſels, by which they are nouriſhed; ſo alſo theſe papillæ, which form the nails, have their veſſels for the conveying nouriſhment to them at the baſe: but as theſe papillæ do not, in their own form, conſtitute the body of the nail, but become indurated as they are elongated, and ſeem only the roots or baſes of hard and rigid fibres, as is alſo the caſe in the hairs; ſo theſe indurated parts of them have fewer than the more tender, but yet enough for their nutrition are continued along them. Their growth is by means of theſe, and it continues as long as the perſon lives. It has been ſaid of the nails, as well as of the hair, that they grow after the perſon is dead; but this is evidently an error, as much as the other *.

The uſes of the nails are, 1ſt, To ſtrengthen and defend the extremities of the fingers and toes, that they may not be ſo eaſily hurt by external accidents, as they otherwiſe would have been. 2. To aſſiſt the fingers, in the laying hold of little things, the more readily, and in the holding

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* See Ruyſch, Adverſar. Anat. Dec. 2. p. 46.

them the more firmly. 3. To be convenient to us in cleanſing the ſkin from any accidental foulneſſes on its ſurface. 4. On the toes, they ſerve to make us tread the firmer, and to prevent the painful colliſion their ends would otherwiſe be almoſt continually ſubject to.

Among the various animals, the claws, which are perfectly analogous to our nails, ſerve them for ſeizing and tearing their prey, and for climbing trees: the ſquirrel, &c. make the latter uſe of them; the beaſts of prey, in general, the former. Among the other animals, in ſome they ſerve as ſhoes to walk on; in others, they anſwer both this purpoſe and that of offenſive weapons, as in the horſe, to ſtrike with *.

The fat, and membrana adipoſa.

201. We next come to the conſideration of the pinguedo, or fat, and of the membrana adipoſa. In theſe we are to obſerve, 1ſt, the ſituation, which is almoſt univerſally over the body, immediately under the cutis; and, beſide this, in many parts in the interſtices between the muſcles, in the orbit of the eye, in the omentum and meſentery, about the kidneys, and elſewhere.

It is compoſed of a thin, tranſparent membrane, furniſhed with a multitude of cells, communicating in various manners with one another; and of a fat, oleaginous, or butyraceous matter, ſecreted from the blood, and filling up the cavity of theſe cells. This oleaginous matter, which is properly and diſtinctly called fat, is not ſecreted from glandules, but from the little arteries of the membrane themſelves. In bodies greatly emaciated, we find only this cellular membrane with the cells empty.

Authors diſtinguiſh the fat of animals into two kinds, which they expreſs by the words *ſevum* or

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* See Schrader's Diſſertatio de Armatura Brutorum.

adeps, and pinguedo. According to this diſtinction, there is no ſuch thing as ſevum or adeps in the human body; its fat is all of the kind expreſſed by pinguedo.

The blood-veſſels of the membrana adipoſa are very numerous: they are propagated from the circumjacent parts, and enter, and, as it were, ſurround the cells of the membranaceous cellules. The nerves are few, and very ſmall; whence it has little ſenſation. Authors mention, beſide the arteries, veins, and nerves of theſe parts, certain veſſels, which they call vaſa adipoſa; but it does not appear certainly, that there are any veſſels diſtinct from thoſe already mentioned, and from the cells of the membrane.

That the oleaginous matter of the fat has a circulatory motion, or an egreſs into the veins, is very evident from the conſumption of it in many diſeaſes, which is extremely ſudden; and from its vaſt and almoſt immediate diminution, only from the effect of violent exerciſe, or labour.

The uſes of the fat are, 1. To ſerve as a kind of covering to the body, defending it from cold. 2. To defend the more tender and ſenſible parts from being too ſtrongly vellicated by the ſalts. 3. To preſerve in good order the flexion of the muſcles, of the cutis, and of the other parts between and about which it is placed. 4: To facilitate the motions of ſome parts, as of the eyes, the jaw, &c. 5. To fill up a number of empty interſtical ſpaces, and by that means to add greatly to the ſymmetry and beauty of the parts; as is evidently the caſe in the face, the neck, &c. and to facilitate the diſtenſion of the parts, the ſpaces between which it thus fills up: this is evidently a great uſe of the fat about the vagina, the anus, the oſſa iſchii, and pudenda; which fills up a great many large interſtices there, and gives way greatly in the diſtention of thoſe parts in the excluſion of the fœtus, and even of the harder excrements. 6. To prevent the painful preſſure and attrition of the parts, particularly in the ſoles of the feet, the nates, and other the like parts, on which we ſtand or ſit, &c. in all which the fat is copiouſly diſpoſed, and ſerves in the place of a cuſhion for the muſcular fleſh to reſt upon. And, finally, there is great reaſon to ſuppoſe, that, when the body does not receive nutrition in the uſual way, the regreſs of this into the veins ſupplies it.

Panniculus carnoſus.

202. The panniculus carnoſus is deſcribed, by moſt of the anatomical writers, as a fourth common integument of the human body: it is a robuſt, muſculous, and fleſhy tunic, ſituated, in beaſts, between the cutis and the fat; and it is by means of this, that thoſe creatures are able to move their ſkin, either totally or in part, as we ſee them frequently do, to diſlodge flies, &c. It is not allowable, however, to deſcribe this as a part of the human fabrick, analogous to what we ſee of it in brutes: there is no ſuch integument in man, except poſſibly about the face; and it is evident, that man cannot want it, as his body is defended by cloaths, from the occaſion of the beaſt's exerting its motion.

Membrana muſculorum communis.

203. The common membrane of the muſcles is alſo, by ſome, reckoned among the number of the integuments of the human body: this has its place immediately under the fat, and is ſaid to ſurround intirely all the muſcles. This, however, is alſo improperly called a common or univerſal integument; ſince it is not expanded over the whole body, but is only found in ſome particular parts of it, and is wholly wanting in many. Magnetus and Verheyen very improperly divide

the tunica adipoſa into three membranes, for the ſake of making out the old number of integuments *; ſince thoſe which are wanting in the human frame, are by no means to be ſupplied by an imaginary partition of this.

204. Having thus gone thro' the enumeration of the common integuments of the body, we are to proceed, in the order of diſſection, to the teguments of the abdomen in particular, or its continent parts: which are, beſide the oſſa innominata, the os ſacrum and its appendage, and five vertebræ of the loins, the diaphragm, the muſcles of the abdomen, and the peritonæum. The diſſecter always begins with this part, becauſe the fæces, contained in it, render it, before all the other parts of the body, obnoxious to putrefaction; and all the others are kept longer ſweet, and fit for examination, after the ſeparating the contents of this.

Muſcles of the abdomen.

205. In regard to the muſcles of the abdomen, we are to obſerve their ſituation: they occupy, and indeed compoſe, the greater part of the circumference of the abdomen. We are to remark alſo the linea alba, which extends itſelf from the ſternum to the juncture of the oſſa pubis, in form of a broad and ſtrong white ſtreak: this is compoſed of the tendons of the muſcles of the abdomen, implicated together in an amazing manner; and in the middle of this is ſituated the umbilicus, or navel.

The number of theſe muſcles is properly five pair †. The firſt pair are the recti: theſe have their origin in the oſſa pubis, and terminate at the ſternum and four of the ribs. In theſe there are various tendinous diviſions.

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* See Morgagni, Adverſ. Anat. 2. p. 17.

† See excellent figures of theſe in Cowper's Myotomia.

The ſecond pair are the oblique deſcendentes: theſe ariſe from the ſeven ribs, from the fifth to the eleventh; and terminate by their aponeuroſes, in the ſpine of the ileum, the os pubis, and the linea alba, which ſeveral fibres however paſs through.

The third pair are the oblique aſcendentes: theſe ariſe from the oſſa ilei, the os ſacrum, and the ſpines of the loins; and are inſerted partly in the lower ſide of the ſpurious ribs, and partly in the linea alba.

The fourth pair are the tranſverſi: theſe ariſe from the tranſverſe proceſſes of the loins, and are connected to the diaphragm; and they terminate in the linea alba.

The fifth and laſt pair are the pyramidales: theſe are very ſmall. They have their origin at the junctures of the oſſa pubis: they thence riſe ſtrait to about four fingers breadth, and there terminate in the linea alba. Sometimes this pair is found wholly wanting, ſometimes there is only one of them inſtead of the pair, and ſometimes there are both.

Theſe muſcles are furniſhed with arteries and veins from the intercoſtal, lumbar, mammary, and epigaſtrick veſſels; and with nerves, which are conſiderably large, from the dorſal and lumbar ones.

There is an annulus, or ring, in the lower part of the oblique deſcendens; and a perforation in the oblique aſcendens, ſerving for the giving paſſage to proceſſes of the peritonæum, and the ſpermatick veſſels in men, and to the ligamenta rotunda of the uterus in women. In ruptures the inteſtine and omentum make their way alſo thro' this opening. The tranſverſi are not penetrated, but their paſſage is under their limb.

Finally, we are to obſerve the ligamentum poupartii, which is placed between the ſpina ilei and os pubis.

The uſes of the muſcles of the abdomen are, 1. To contain and defend the viſcera lodged in the abdomen. 2. By their continual motion to aſſiſt in digeſtion, and in the progreſs of the chyle. 3. To promote the excretion of fæces and urine continually, and of the fœtus and ſecundines in time of delivery. 4. To be of uſe in reſpiration. 5. To aſſiſt in the facilitating the various flexures of the body. 6. To aſſiſt in the motion which occaſions the ſtomach to throw up its contents in vomiting. And, 7. In various other motions.

The peritonæum.

206. The peritonæum lies immediately under the tranſverſe muſcles of the abdomen, and adheres to them. It is a thin, ſmooth, and lubricous membrane, inveſting the whole internal ſurface of the abdomen; and containing moſt of the viſcera of that part, as it were, in a bag: it coheres alſo with the diaphragm, and with all the viſcera lodged in this part. It intirely encloſes the ſtomach, the inteſtines, the meſentery, the omentum, the liver, the ſpleen, and the pancreas: theſe are, therefore, ſaid to be lodged in the duplicature of the peritonæum. The kidneys, ureters, and ſmaller veſſels of the abdomen, it covers only on their anterior part; and the urinary bladder only on the poſterior. This is the caſe in the human body, and this is very different from what comparative anatomy ſhews us among the brutes *.

The peritonæum is compoſed of a double membrane, or lamella: the exterior one has longitudinal and ſlender fibres; the interior has tranſverſe

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* In what manner the peritonæum covers the bladder, Cheſelden has elegantly ſhewn in his treatiſe on Lithotomy.

verſe and more robuſt ones *. There are alſo ligaments formed from it: 1. That which ſuſpends the liver. 2. The two ligamenta lata of the uterus in women.

Its proceſſes, which it ſends out of the abdomen, are two: they ſerve to ſurround and encloſe the ſpermatick veſſels and the teſticles. In regard to theſe, we are to obſerve, 1. Their ſurpriſing paſſage between the muſcles of the abdomen. 2. Their hiatus, ſo viſible in the abdomen of a dog, but wanting in the human body. 3. The ſeptum, ſerving to ſeparate the teſticles, are the upper part.

We are alſo to obſerve the involucra of the ligamenta rotunda in women, and their diverticula: Nuck has finely delineated theſe in his Adenographia, p. 39, 40.

The arteries and veins of the peritonæum are ſupplied from the epigaſtrick, mammary, lumbar, and diaphragmatick veſſels; and to theſe ſome add lymphaticks.

The nerves are propagated from thoſe of the diaphragm, back, loins, and os ſacrum. Many of the anatomical writers have alſo mentioned glands in the peritonæum; but, in the natural ſtate of the part, no ſuch are obſervable.

The uſes of the peritonæum are, 1. To incloſe the contents of the abdomen; for when this part is dilated, wounded, or broken, they fall out of their due places, and ruptures are formed. 2. To give an external covering to almoſt all the parts contained in the abdomen, which are therefore generally ſaid to have their external membrane from the peritonæum. 3. To form the proceſſes of the peritonæum, and the tunica vaginalis of the teſtes.

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* See Santorini, p. 164.

CHAP. II.

Of the Contents of the Abdomen.

207. WHEN the peritonæum is carefully laid open, there appear the vaſa umbilicalia, which, in adults, are found degenerated into ligaments: theſe are two arteries, a vein, and the urachus, lodged within the double lamella of the peritonæum *. Theſe almoſt entirely diſappear in adult brutes; or, at the utmoſt, are much leſs diſtinguiſhable in them than in men. Du Verney obſerves, however, that the umbilical arteries always retain their cavity down to the fundus of the urinary bladder, and that the bladder always receives branches from them †.

After theſe comes in ſight the omentum, or epiploon, lying upon the inteſtines; and under this the inteſtines themſelves, which fill up the greater part of the abdominal cavity; the ſmaller inteſtines lying in the middle, the larger toward the circumference.

We are then to obſerve the meſentery, or membrane, which connects the inteſtines; the ſtomach, which occupies the upper part of the cavity toward the left ſide; the liver, with the gall-bladder, ſituated on the right ſide, or in the right hypocondrium; the ſpleen, on the left ſide, behind the ſtomach, and adhering to the diaphragm and the ſpurious ribs: the ſituation of this part prevents its coming in ſight, till the ſtomach is removed. The two kidneys, which are hid, as it were, behind the inteſtines, and lie upon the loins; the urinary bladder, placed in the loweſt part of the abdominal cavity, called the pelvis, and connected with the oſſa pubis, by means of the peritonæum. The bladder in the human body, when empty, is ſo ſmall, that it is ſcarce obſervable, unleſs diſtended.

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* See Santorini, Obſ. Anat. p. 164.

† See Garengot's Chirurg. T. 1. p. 222. See alſo more of theſe veſſels in our chapter of the Fœtus.

After this we are to obſerve the pancreas, which is a large gland placed under the ſtomach; and then the parts ſerving to generation, as, in men, the veſiculæ ſeminales, &c. and, in women, the uterus, its ligaments, the ovaries, the Fallopian tubes, and the other parts belonging to the uterus.

We are to obſerve, in this cavity alſo, the aorta, or great artery; and the vena cava, and vena portæ; and the emulgent iliac, meſenterick, and other arteries and veins, which are conſpicuous and numerous.

208. The omentum is a membranaceous part, uſually furniſhed with a large quantity of fat, and is placed under the peritonæum, and immediately over the inteſtines. It is called, by ſome authors, rete and reticulum, from the number of holes appearing in it when raiſed, and giving it the reſemblance of a net; but theſe are not natural. The Greeks called it epiploon. Omentum.

As to its ſituation, it uſually occupies only the upper part of the abdomen; but ſometimes we find it extended to the lower part alſo. Its weight in an adult human ſubject, not remarkably fat, or remarkably lean, is about half a pound: in brutes it varies extremely, in proportion to their being more or leſs fat. As to its connections, its lower part is evidently looſe and free: in its upper part it is joined, in its anterior part, to the bottom of the ſtomach, the duodenum, and the ſpleen; and in its poſterior part, to the colon and pancreas.

It is compoſed of a very tender double membrane, forming a kind of pouch, with a cavity called by authors its burſa. It has a quantity of fat in certain cellules, deſtined for that purpoſe, and forming a kind of ducts: theſe ſurround the blood-veſſels, and have between them certain areolæ, or membranaceous ſpaces.

Its arteries are called arteriæ epiploicæ *: they come from the cœliaca, and are very numerous. Its veins are derived from the vena portæ, and principally from the ſplenic branch: its nerves are from the intercoſtals, and the par vagum; and beſide theſe, it has ſome lymphaticks.

It has a very remarkable natural aperture, diſcovered by Winſlow, by which it may be conveniently and elegantly diſtended by inflation; and there are generally ſome ſmall natural foramina in it; tho' the larger ones, from which it had its name *rete*, are adventitious. Malpighi has been at great pains to deſcribe what he calls ductus adipoſi, in the omentum; but what he gives this name to, are no other than the lateral diverticulations of the blood-veſſels, which running to the cells, there ſecrete and depoſit the oleaginous or fat matter. Theſe cellules, as well as the others †, where fat is lodged in other parts of the body, communicate alſo with one another, and with the veins of the part.

The uſes of the omentum are, 1. By its lubricity, to render the neceſſary and natural motions of the inteſtines eaſy. 2. To cheriſh and defend the inteſtines from cold. 3. To aſſiſt in the formation of the bile, the fatty part of which is wholly owing to the veſſels of the omentum,

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[*] See an accurate delineation of theſe arteries in Ruyſch's Theſaur. Anat. 2. T. 5. fig. 1.

[†] See Maur. Hoffman, idea, p. 23.

every thing that returns from this part, going into the liver. 4. To temperate the acrimony of the humors. And, probably, 5. To ſerve, as all the other fat parts of the body, to give it nouriſhment, when it is incapable of being nouriſhed any other way.

The ſtomach.

209. The ſtomach, or ventricle, is a hollow membranaceous part; placed, for the moſt part, in the left hypocondrium, immediately under the diaphragm, and, in an oblique ſituation, between the liver and the ſpleen. In this we are to obſerve, 1. Its figure, which is like that of the bag of a pair of bag-pipes. 2. Its diviſion into three parts, that is, into two orifices and a bottom.

Its left orifice, called cardia, is placed much higher than its right, and is continuous with the gula, and furniſhed with a great number of nerves.

Its right orifice is called the pylorus, and is connected with or opens into the inteſtines: in this part there is a ſingular valve, the office of which is to cloſe the ſtomach *. We are alſo to obſerve the ligament, by which the pylorus is connected to the upper part of the ſtomach.

The ſize of the ſtomach, in human ſubjects, is very various: in people addicted to gluttony, it is uſually very large; and in men it is, in general, larger than in women. In the human body it is always ſingle; but many of the beaſts have ſeveral ſtomachs.

Its veſſels are arteries, veins, nerves, and lymphaticks. Its arteries, called gaſtricæ, it receives from the cœliac: the gaſtrick veins all run to the vena portæ. Among theſe we are to obſerve the vaſa brevia, which go off to the ſplenic branch, and the vena coronaria, which ſurrounds the ſtomach.

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* See its figure, Tab. 6.

Its nerves principally enter at the left orifice: they come from the par vagum, and are very large; and hence it is, that the ſtomach is ſo ſenſible.

The lymphaticks go to the receptaculum chyli.

The ſubſtance of the ſtomach is membranaceous: it is compoſed of four coats.

The firſt coat is membranaceous, in the ſtrict ſenſe of the term: the fibres of this run tranſverſely. The ſecond is muſculous; and in this the courſe of the fibres is various, and, as it were, inextricable: ſome of them run circularly, as it were, from the upper part to the lower; and others only on the upper part of the ſtomach, between the two orifices: others run obliquely from the left ſide to the right, and ſome ſurround the orifice.

The third coat of the ſtomach is nervous: this forms a multitude of wrinkles, and is furniſhed with a number of ſanguiferous veſſels and ſmall glands, which ſecrete the liquor gaſtricus, or liquor of the ſtomach. This is more readily obſerved in hogs than in the human body.

The fourth is villoſe, thin, and porous*: it adheres very firmly to the former.

The uſe of the ſtomach is for the digeſtion of our food, that is, to receive, contain, diſſolve, and change what is ſwallowed by the mouth; and after a ſufficient concoction, to expel it thro' the pylorus into the inteſtines: poſſibly alſo, it abſorbs and retains the more ſubtile parts of what it has thus prepared for nutrition. It alſo is the organ in which the ſenſation of hunger reſides.

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* See Ruyſch's Theſaur. Anatom. 2. T. 5. fig. 2. and of the papillæ of the ſtomach, ſee the ſame author, Adverſ. 3. p. 33.

The inteſtines. 210. The inteſtines are long and large, cylindrick, hollow, membranaceous bodies; or rather one ſuch continued body, reaching from the ſtomach to the anus. In theſe we are to obſerve, 1. Their length, which is uſually ſix times as much as the height of the man they belong to. 2. Their wonderful circumvolutions, and the uſes of them. 3. Their connection, by means of the meſentery, with the vertebræ of the loins. 4. Their number, which tho' properly and exactly, as before obſerved, it be but one, yet is uſually made ſix. Of the ſix inteſtines of this diviſion, three are called the ſmaller inteſtines, inteſtina tenuia; and the other three the larger, or inteſtina craſſa.

Duodenum. Of the firſt three, called the ſmall guts, or inteſtina tenuia, the firſt is the duodenum, ſo named from its length, which is about that of twelve fingers. This has its origin at the pylorus, and at its beginning aſcends a little; but after this it deſcends; and toward its end, finally aſcending again, it runs tranſverſely toward the left kidney: it receives, at the diſtance of three or four fingers from the pylorus, at one prominent hiatus or mouth, the oſcula, or apertures of the cholidick and pancreatick ducts, for the ſuſception of the bile and the pancreatick juice. The thickneſs of the coats of the duodenum is greater than that of any other of the ſmall guts; and its cavity is alſo greater than that of any of them: in its beginning it has no valves, nor rugæ; but in its continuation it has very numerous and remarkable ones, called by authors juga *. It has alſo the glands called glandulæ brunneri, in great number, ſerving for the ſecretion of a thin aqueous fluid †;

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* See Santorini, p. 167.

† See Santorini, Tract. de Valv. Duodeni.

and it has an artery from the cœliac, and a vein, as the reſt of the inteſtines have, from the porta.

Jejunum. The ſecond of the ſmall guts is the jejunum, ſo called becauſe it is uſually found empty. This is owing to the fluidity of the chyle, the greater ſtimulus of the bile in it, and the abundance of the lacteal veſſels which it is furniſhed with. Its ſituation is in the region above the navel: it has a great many connivent valves. Its beginning is where the duodenum ends; and its termination in the place where the valves, juſt mentioned, are obliterated. Its length is different in various ſubjects: it is uſually, however, between that of thirteen and ſixteen ſpans. It is generally ſhorter than the ileum.

Ileum. The third and laſt of the ſmall guts is the ileum. Its ſituation is principally below the navel, near the oſſa ilei, whence it has its name. Its length is various: ſometimes not more than fifteen, ſometimes twenty ſpans, or more. Its beginning is where the valves of the jejunum ceaſe to be conſpicuous, and its end is where the larger inteſtines begin; in which place it is, in a very ſingular manner, inſerted into the left ſide of the colon *. Valves it has none, unleſs that great one at the end, which is called, by many, valvula coli Bauhini: its glands are, in general, more numerous toward the end than in any other part.

Cœcum. Of the three large inteſtines, called, from their ſize, inteſtina craſſa, the firſt is the cœcum: this is ſituated at the right os ileum, and reſembles a bag, and has a vermiform or worm-like appendage fixed to it. It begins at the termination of the ileum, and terminates in the bottom of the bag or ſacculus which it forms: its length is not more

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* See the author's diſſertation de Valvula Coli. See alſo here fig. 7. and Morgagn. Adverſ. T. 3. fig. 2.

more than three or four fingers breadth. In the appendage, opening into the ſide of the cœcum, there are ſome glands; which, together with its erect ſituation, as that is uſually the caſe, ſeems to ſhew that ſome fluid is ſecreted there. In hens this is double; as alſo in many others fowls. In fiſhes there are frequently a vaſt number of them; in ſome ſpecies, not leſs than four hundred *. In man it is, at the utmoſt, ſingle, and is often wanting †.

The ſecond of the inteſtina craſſa is the colon. Colon. The ſituation of this is at the circumference of the ſmaller inteſtines; and it is uſually, ſtrangely, and variouſly convolected and flexuous. Its beginning is above the termination of the ileum, and its end is at the os ſacrum. It is connected with the os ilei, the right kidney, the gall-bladder, the liver, the ſtomach, the ſpleen; and, finally, with the left kidney. Its length is from five to ſeven ſpans: its diameter is the greateſt of that of any of the guts. It has three ligaments running longitudinally in it, and terminating in the vermiform proceſs §. It has alſo certain external adipoſe appendiculæ, which ſerve to lubricate it ‡. The connivent valves are larger in this than in any other of the guts; and the coats it is compoſed of, are ſtronger than in the ſmall guts.

The third and laſt of the inteſtina craſſa is the rectum. Rectum. It is thus called from its ſituation, which is ſtrait or perpendicular upon the os ſacrum. Its length is about three hands breadth; and its diameter about three fingers. It has its beginning at the loweſt vertebræ of the loins: its extremity is

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* See Grew's Comparative Anatomy of Guts.

† See Morgagni, Adverſ. 3. p. 27.

§ See Morgagni, Obſ. Anat. 3. p. 27. fig. 3.

‡ Ruyſch, Muſ. Anat. p. 75, and 76.

what is called the anus. This is furniſhed with three muſcles; one called the ſphincter, whoſe office it is to cloſe the anus; and two others, called elevatores, whoſe office is to draw it up. Of theſe we ſhall ſpeak in their proper place, among the muſcles. It is connected to the os ſacrum, the os coccygis, and the urinary bladder, in men; but in women to the vagina uteri. The coats of the rectum are more thick and fleſhy, than thoſe of any other of the inteſtines: it has, in general, no valves; but it has ſeveral rugæ. The abſence of valves here, is to prevent the expulſion of the fæces from being retarded. The anus is ſurrounded with a large quantity of fat, to the end that it may be eaſily dilated, in the evacuation of its contents.

Structure of the inteſtines.

211. The ſtructure and ſubſtance of the inteſtines is membranaceous: they are formed, in every part, of five coats or tunics.

The firſt is the common coat, from the peritonæum, and is membranaceous.

The ſecond is cellular; and is called, by the late writers, tunica celluloſa Ruyſchii. This is continuous with the meſentery, and is to be diſcovered by inflating it *. This coat, in fat animals, alſo frequently contains abundance of fat.

The third is muſcular: this is compoſed of a double ſeries of fibres, in part longitudinal, and in part annular; and theſe aſſiſt the motion of the guts.

The fourth coat is nervous: it is furniſhed with abundance of cellules, vaſcules and glands, and is thicker than the others. From this ariſe the rugæ, and the valves of the inteſtines.

The fifth is the villoſe coat: this ſuſtains the terminations of the excretory veſſels, and the begin-

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* Ruyſch, Theſ. Anat. 6. T. 5. fig. 2.

beginnings of the lacteals. Hence, when nicely examined, it has the appearance of a ſieve *. It is the organ of percolation of the chyle.

The inteſtines have veſſels, in great abundance, running over every part of their ſubſtance. Their arteries are from the meſeriac ones; the upper meſeriac ſerving for the ſmaller inteſtines; the lower for the larger: theſe make a multitude of very ſingular and ſurpriſing anaſtomoſes. The veins are the meſeriacks, and go off to the vena portæ and the liver. The nerves are ſent from the intercoſtals, and the par vagum. And beſide theſe, we are to obſerve the lacteal veſſels; of which we ſhall treat more at large hereafter.

The rectum, it is to be obſerved, receives blood-veſſels alſo from the hypogaſtricks.

There are alſo, beſide the brunnerian glands of the duodenum, other glands in the inteſtines, called, from the name of the perſon who diſcovered them, glandulæ Peyeri. Theſe, in the ſmall guts, are uſually little, congregate, and miliary: ſometimes they are ſingle. They are larger as they are nearer the duodenum, and ſmaller as they approach toward the great guts. Their office is to diſcharge into the inteſtines a liquor, which ſerves for the attenuation of the chyle, and for the lubricating of the inteſtines. In the larger guts, and in the vermiform appendage, they are ſingle and large, of a lenticular figure; and they are largeſt of all in the rectum. They have mouths, out of which there is ſecreted a fluid, ſerving to lubricate the ſides of the inteſtines, and to ſoften the fæces, that they may be evacuated without pain.

The uſe of the ſmaller guts is to promote the formation of the chyle, to perfect its ſecretions,

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* Ruyſch's Epiſt. 11. T. 12.

and to propel the remaining fæces to the larger. The office of the larger guts is to receive and collect the matter of the fæces, and at a proper time to expel it.

The meſentery.

212. The meſentery is a thick fat membrane, placed in the midſt of the inteſtines, particularly of the ſmaller ones, whence it has its name. In obſerving this we are to regard, 1. Its ſubſtance, which is compoſed of membranes, fat, veſſels of all kinds; and, in the human body, of a number of glands. 2. Its connections, which are, in the upper part, with the three ſuperior vertebræ of the loins; in the lower, with the inteſtines, and particularly with the jejunum and ileum; to which it alſo gives their outer coat. 3. Its diviſion, according to the anatomical writers, who call that part of it, which joins the colon, the meſocolon; that part which joins the other inteſtines, &c. the meſenterium, or meſeræum. 4. Its circumference, in which, when ſeparated from the inteſtines, there are ſeveral folds or plicæ, giving it the reſemblance of gloves. Its length, in the whole, is about three ells; but the inteſtines, which are joined to it, are at leaſt of four times that length.

Its coats or membranes are two, a ſuperior, and an inferior; and between them there is a cellular ſubſtance, containing the fat; and the meſeriack veſſels and glands are alſo placed there. Many reckon this a third coat of the meſentery, and that not improperly: they call it the tunica celluloſa *.

The veſſels of the meſentery are blood-veſſels, nerves, lacteals, and lymphaticks. The blood-veſſels are the ſame with thoſe of the inteſtines,

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* See Wharton's Adenographia, cap. 8. and Ruyſch's Theſaur. 6. p. 76.

and they make a multitude of ſtrange meanders, and have very frequent anaſtomoſes *. The nerves alſo come from the par vagum, and the intercoſtals. The lacteals and lymphaticks we ſhall treat of, in their place, hereafter.

There are a multitude of glands diſperſed throughout the whole meſentery †. Theſe vary greatly, in different ſubjects, in their ſize, figure, and ſituation: in old ſubjects, they often almoſt diſappear. In comparative anatomy we find, that in dogs there is only one, but that very large, and called pancreas Aſellii. The lacteal veſſels paſs thro' theſe glands; and their office is to ſecrete a fluid, which is to ſerve for the diluting of the chyle.

The uſes of the meſentery are, 1. To ſuſpend, connect together, and retain, in their due place, all the inteſtines. 2. To ſuſtain the ſanguiferous and lacteal veſſels of the inteſtines. And, 3. To make the way, for the lacteals to the receptacle, ſhorter.

Vaſa chylifera.

213. The veſſels called vaſa chylifera, comprehend the lacteals and the thoracic duct. They are fine ſubtile canals, ſituated in the inteſtines and the meſentery, and whoſe office it is to convey the chyle to its deſtined places.

Aſellius has the honour of paſſing for the firſt diſcoverer of them. He demonſtrated them in the year 1622; but they were long before obſerved by Eraſiſtratus and Galen, who took them for arteries containing milk.

The moſt convenient method of demonſtrating them is, in comparative anatomy, by feeding ſome animal plentifully; and, in about three

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* See theſe delineated in Euſtachius, Drake and Cheſelden.

† See theſe elegantly figured in Ruyſch's Opuſc. de Gland. fabric.

hours afterwards, ſtrangling it. In this caſe they are all turgid with chyle: at other times they are filled with a lymphatick juice, not with chyle; and are accordingly called not chyliferous veſſels, but lymphaticks.

When the creature is opened, the ductus thoracicus, hereafter to be deſcribed, is to be tied with a thread: this makes the ſeeing them the more certain and eaſy; but often they may be diſtinguiſhed without this aſſiſtance very plainly.

The difficulty of demonſtrating them, in human ſubjects, ariſes from our not making our diſſections of them immediately after death, or while the fleſh is yet warm; for, ſoon after death, they wholly diſappear. Sometimes, however, they are obvious enough to be clearly diſtinguiſhed, even in human ſubjects; eſpecially in ſuch as have been ſuffocated or ſtrangulated: ſometimes in ſuch as have died of particular diſeaſes.

The origin of the chyliferous veſſels is from the inteſtines, and principally from the ſmall ones: in all theſe their roots are extremely numerous, and eaſily diſtinguiſhable; much more ſo, indeed, in the human body than in dogs *, which are the animals uſually experimented upon. In the larger guts they are very few, and often none at all can be ſeen there †.

Anatomiſts diſtinguiſh the lacteals into two kinds, which they call lacteals of the firſt and of the ſecond order. Thoſe of the firſt order, are ſuch as run from the inteſtines to the glands of the

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* See a delineation of them, fig. 8. from a human ſubject. What draughts others have given of them, ſeem to have been taken from other animals.

† See our author's obſervations in the Ephemerides, N. C. Cent. 5. p. 234. and Philoſophical Tranſactions of England, N°. 307.

the meſentery: thoſe of the ſecond order, are ſuch as run from the glands to the receptacles, where they terminate. Theſe laſt are larger than the former; but they are alſo fewer in number.

In the chyliferous veſſels there are alſo ſemilunar valves: theſe are double, and are placed oppoſitely, and they prevent the reflux of the contents; but they are much leſs frequent in theſe veſſels than in the other lymphaticks *.

The uſe of the chyliferous veſſels is to carry the chyle from the inteſtines, thro' the meſentery, to the common reſervoir, or receptaculum chyli.

It is obſervable, that, in birds, there is a defect of the chyliferous veſſels; the chyle, in theſe, entering the meſeriac veins.

Ductus thoracicus.

The ductus thoracicus, or chyliferous duct, is a very tender canal, receiving the chyle from the chyliferous veſſels, and the lymph from the lymphaticks, and carrying them to the thorax, and uſually thro' it to the ſubclavian vein.

Pecquet has the honour of being accounted the firſt obſerver of it †: he demonſtrated it in the year 1651; but Euſtacius had diſcovered it long before him, tho' he has expreſſed himſelf too obſcurely §.

The beginning of this duct is in the reſervoir, or receptaculum chyli, which is ſituated in the left ſide of the upper vertebra of the loins, under the aorta, and the veſſels of the left kidney: the reſt of the duct has ſome reſemblance of a ſack or bag, and is larger, and irregular in its figure. Its end is uſually in the left ſubclavian vein, ſometimes in the jugular.

In dogs, and many other animals, its progreſs is under the aorta; but, in the human body, it

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* See Ruyſch's Dilucidatio Valvularum.

† See Pecquet's Exp. Anatom.

§ See Euſtachius, Lib. de Vena azygos.

aſcends along the right ſide of the vertebra of the back, and paſſes between the aorta and the vena azygos; ſometimes with a ſimple trunk, ſometimes divided into two. Its breadth, where undivided, is about that of a wheat-ſtraw.

The beſt method of demonſtrating it in animals, is to feed a dog well, then ſtrangle him; and, as ſoon as the body is opened, to tie it up with a thread in the breaſt, juſt by the ſubclavian: by this means the ciſtern, or receptacle of the chyle, and the chyliferous veſſels and lymphaticks, all are expoſed evidently to the view at once.

In a human body they may alſo be obſerved, any time after death, by injecting, according to Salzman *, wax, or any fluid, or indeed only by inflating the great lymphatick veſſel, which runs by the left emulgent vein: or otherwiſe, if, according to Henninger †, an injection, or barely an inflation, be made into a lacteal of the ſecond order, to be traced out in the midſt of the meſentery: or, finally, if the pleura be carefully cut between the aorta and the vena azygos, the duct will uſually be eaſily found there.

It is compoſed of a fine, thin, and pellucid membrane; and within it there are valves, as in the lacteals and lymphaticks, which prevent the reflux of the chyle: there are more of theſe in the human body than in beaſts. And, finally, there is a ſemi-lunar valve, cloſing its extremity, under the ſubclavian.

The uſe of the ductus thoracicus is to carry the chyle to the blood, thro' the thorax, as it receives it from the receptacle, and with it the lymph from the lymphaticks.

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* See Pecquet's Diſſertation, printed at Straſburg 1711.

† See Ephemerides Nat. Cur. Cent. 4. App. p. 120.

215. Next to the chyliferous veſſels, we are to mention the lymphaticks, which are of a very ſingular ſtructure, and are to be demonſtrated at the ſame time in diſſections. They are thin, ſubtile, and pellucid veſſels; and uſually convey thro' them an aqueous fluid, called lymph: but in the inteſtines, particularly in the time of digeſtion, they are found filled with chyle; and at that time, as before obſerved, they are called lacteal veſſels. Lymphaticks.

The firſt diſcovery of the lymphaticks is by ſome given to Bartholine, by others to Rudbeck, by ſome to Gliſſon, and by others to Charlton. Their ſituation is in the ſuperficies of ſeveral parts, particularly of the concave ſide of the liver, the neck of the gall-bladder, and the trunk of the vena portæ. They are compoſed, like the lacteals, of a fine and delicate membrane. They have, very frequently, double ſemi-lunar valves: Ruyſch has excellently deſcribed theſe in his book on the valves of the lymphaticks. They have their beginning in moſt of the parts of the body: they have not been diſcovered every where in it; but it is probable that they are there, tho' not yet found. Their terminations or inſertions are, 1ſt, in ſeveral of the larger veins, particularly in the cava and porta. 2. In the ciſtern, or receptacle of the chyle. 3. In the thoracick duct itſelf.

The method of ſhewing them, in diſſection, is by tying up either the thoracick duct or the vena cava, vena porta, the ſplenic, the renal vein, or any other of the large ones, either in an animal yet living, or but juſt dead; or by powerfully inflating the veins, arteries, or excretory ducts of the viſcera, in an animal not yet cold.

The uſe of the lymphaticks is to carry off, from the ſeveral parts, the quantity of lymph that was redundant, in regard to their nutrition;

and to convey it either into the maſs of blood, or into the chyliferous ducts. The refluent lymph, thus conveyed thither by them, ſerves again for a new dilution of the chyle and of the blood.

Pancreas. 216. The pancreas is a large gland, of a flatiſh ſhape and fleſhy colour, extended behind the ſtomach, and reaching from the duodenum tranſverſely toward the ſpleen. In this we are to obſerve the connections it has with the duodenum, the meſentery, with the ſplenic veſſels, and with the ſpleen itſelf. In the human body it is ſimple; but in dogs, cats, and many other animals, it is divided, as it were, into two parts. Its length is eight or nine inches: its breadth is about two fingers, or two and a half: its thickneſs about one finger: its weight about three ounces. In man the pancreas much reſembles the tongue of a dog in ſhape: it is broadeſt towards the duodenum, and gradually narrower toward the ſpleen. It is ſurrounded with a membrane, which is continuous with the peritonæum: its ſubſtance is glandulous, and it ſeems formed by conglomeration of many others. It has arteries from the cœliac and ramus ſplenicus; and veins alſo from the ſplenic vein: its nerves are from the par vagum and the intercoſtals; its lymphaticks are uncertain: and, finally, it has an excretory duct, compoſed of a number of others. Maurice Hoffman firſt diſcovered it in 1641, in a turkey; and afterwards it was diſcovered by Wirtſungius in the human body, as Bartholine, who was preſent, informs us *.

It is commonly ſingle in the human body: ſometimes, however, it is double. In many of the common birds it is double, and in ſome triple.

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* See T. Bartholine, Anat. Reformat. l. 1. c. 13. Alſo Maur. Hoffman, in Hornii Microcoſm, p. 164.

Its ſituation is in the middle of the pancreas, where it reſembles an empty vein, and is of about the thickneſs of a ſmall ſtraw. Its termination is in the duodenum: it enters it obliquely, four or five fingers breadth below the pylorus, uſually at the ſame orifice with the ductus cholidocus: but ſometimes it has a double aperture. In many beaſts it is inſerted into the duodenum by a particular orifice, at a conſiderable diſtance below the pylorus.

The uſe of the pancreas is to ſecrete a peculiar liquor, called the ſuccus pancreaticus: this is of a ſalivoſe nature, and ſerves to attenuate the chyle.

217. The liver is a very large viſcus, of a red colour, ſituated in the right hypocondrium, and ſerving for the ſecretion of the gall. The liver.

In this we are to obſerve its ſize, which is very large, that the bile may be ſecreted in large abundance; its figure, which is irregular; the upper ſurface convex, ſmooth, and equal; the lower, hollow and unequal, and containing the gall-bladder. There is a remarkable eminence in the liver, where the vena portæ enters it, called the porta.

In dogs the liver is divided into lobes; but in human ſubjects there is no ſuch diviſion. Its weight is about four pounds. It is connected, 1ſt, by the ligamenta lata with the diaphragm, and by the ligamentum rotundum with the navel: this laſt ligament has been in the fœtus, the vena umbilicalis. It is connected with the diaphragm alſo by the proper membrane of that part, and by the blood-veſſels; principally the vena cava and vena portæ.

The membrane which ſurrounds the liver is thin, and is continuous with the peritonæum.

In the liver we are alſo to obſerve the capſula Gliſſonii, ſo called from its diſcoverer: this is a tunic, continuous with the peritonæum, and includes the branches of the vena portæ, and the biliary ducts, as they approach the liver, as well as within it.

The veſſels of the liver are very numerous: it has arteries for its nutrition from, 1ſt, the cœliac; 2d, the cyſticks; 3d, the diaphragmaticks; and ſometimes, 4th, from the ſuperior meſenterick.

Its veins are, firſt, from the vena portæ, entering the concave ſurface of the liver: this vein ſupplies the place both of a vein and an artery in this part, bringing in the blood for the ſecretion of the bile; but of this, more in its place. 2d, from the vena cava: and, 3d, from the diaphragmatick vein, for the reflux of the abundant blood to the heart. The nerves of the liver ariſe from the plexus hepaticus of the intercoſtals.

The biliary veſſels, near which there are often glands ſituated, are theſe, 1. The ductus cholidocus communis: this opens obliquely into the duodenum. 2. The ductus cyſticus: this runs from the gall-bladder to the duct already mentioned. In man it is often tortuous, and has frequently valves of various kinds in it. 3. The ductus hepaticus: this runs from the liver to the ductus cholidocus; and the branches of this, diſtributed thro' the whole liver, make what are called the pori biliarii.

The lymphatick veſſels of the liver are to be demonſtrated, either by a ligature of the vena portæ in living animals, or by inflation into the artery, or the hepatick duct. To theſe veſſels we are to add, the canalis venoſus in the fœtus, and the great ſinus of the vena portæ.

The ſubſtance of the liver has been variouſly deſcribed by authors of different times. The antients ſuppoſed it to be formed merely of blood, concreted into a firm maſs, about the ſanguiferous veſſels. Malpighi, and many of the later writers, have determined it to be glandulous; and Ruyſch makes it vaſculous, declaring it to be formed of a congeries of very minute veſſels.

The gall-bladder.

The gall-bladder, called veſicula and cyſtis fellea, is a bladder uſually of the ſhape of a pear, and is ſituated in the concave ſide of the liver. In this we are to obſerve the ſize, which is nearly that of a ſmall hen's egg; its neck, which is capable of ſhuting, as it were, by a ſphincter; and its fundus or bottom: this, in a man who ſtands erect, is its lower part; and its neck its upper. It lies upon the colon, and tinges that part of it with its own colour.

We are to obſerve alſo its coheſion, which is by means of the common membrane, and of the veſſels; its duct, called ductus cyſticus, and mentioned already; and its frænulum, by which the cyſtick duct is joined to it.

It is compoſed of four membranes, or coats: 1. The common coat. 2. A vaſculous one. 3. A muſcular one, conſiſting of ſtrait, oblique, and tranſverſe fibres. And, 4. A nervous one, of a wrinkled or reticulated ſurface within, and furniſhed with an unctuous liquor. In this there are ſometimes certain minute glands diſcoverable.

This fabrick ſeems alſo to be common to the biliary ducts. We are alſo to obſerve the veſſels, which it has in common with the liver, and which in it are called vaſa cyſtica, or cyſtick veſſels *; and the radices felleæ of authors, which are eaſily diſco-

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* Theſe are excellently delineated by Ruyſch, Ep. 5.

diſcoverable in oxen, and other large animals; but not ſo in man.

We are then to enquire into the manner in which the bile is carried into the cyſtis, or gall-bladder: in human ſubjects, the greater part of it ſeems evidently to enter into it thro' the ductus cyſticus, from the ductus hepaticus, and ductus cholidocus; and part of it ſeems as evidently to be ſecreted within the bladder itſelf. In oxen, beſide both theſe ways, there is a great part carried in by the hepatico-cyſtick duct, and the radices felleæ *.

The uſe of the liver is to ſecrete the bile from the blood, brought thither by the vena porta. The antients ſuppoſed its uſe to be ſanguification.

The uſe of the gall-bladder is to collect the bile, firſt ſecreted in the liver, and mixing it with its own peculiar produce, to perfect it farther; to retain it together a certain time, and then to expel it.

The uſe of the bile is to attenuate the chyle, to mix the oleaginous parts of the blood with the aqueous, to ſtimulate the inteſtines, and, in part, to change the acid of the chyle.

The bile is properly of two kinds, and is diſtinguiſhed under them by the names of cyſtick and hepatick. The hepatick bile is thin, almoſt inſipid, and ſcarce coloured. The cyſtick bile is thicker, more coloured, and very bitter.

The ſpleen.

218. The ſpleen: lien, or ſpleen, is a viſcus of a deep blackiſh-red colour, ſituated on the left ſide of the ſtomach, under the diaphragm, and near the ribs. It is uſually ſingle, tho' ſometimes there have been found ſeveral in the place of one †.

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* See Bohn, in the Acta Erudit. 1682, p. 20. 1683, p. 126. and Verheyen, T. 11. fig. 6.

† See Schelham. Analect. Diſſ. 10, and 11. and Cheſelden's Anat. p. 181.

Its figure is ſomewhat uncertain; but it is uſually that of a tongue, it is hollow toward the ſtomach, and convex toward the diaphragm and ribs: often however it is irregular, and has in many parts fiſſures. It is connected with the ſtomach by the vaſa brevia; and with the pancreas omentum, the diaphragm, and the left kidney, by membranes. Its ſize is various. Its length is uſually five or ſix inches in the human body. In dogs, hogs, and many other animals, it is much longer and thinner. Its breadth is about three inches: its thickneſs about an inch; and its weight about twelve ounces.

In human ſubjects the ſpleen has but one membrane; but in calves, and ſome other animals, it has two: in this caſe the external one is robuſt, common, and adheres but laxly, by means of the ſanguiferous veſſels, to the inner, which is proper and very thin, and, when the outer one is taken off, tranſmits the breath.

The veſſels of the ſpleen, conſidering its ſize, are remarkably large. Its artery is from the cœliac, and is called the ſplenic artery: this, in human ſubjects, readily tranſmits water, air or mercury, thrown into it, into the veins.

The ſplenic vein, in calves, &c. is, ſoon after its ingreſs into the ſpleen, tranformed into cells: but, in human ſubjects, it is, as in the other viſcera, very much ramified; and its branches are carried throughout the whole ſpleen *.

In calves both veſſels enter at one extremity; but in the human body they are divided into various branches, and run over the whole concave or

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* Ruyſch has demonſtrated this, againſt the opinion of moſt of the modern writers, Epiſt. 4. T. 4. Moſt other anatomiſts have given their draughts of the ſpleen from that of a calf, not from a human one.

internal ſurface. The nerves of the ſpleen are from the plexus ſplenicus. The ſpleen has no excretory duct; but there are in it lymphatick veſſels, running to the receptacle.

The ſubſtance of the ſpleen has been ſaid to be celluloſe and glanduloſe. In calves, indeed, it is celluloſe; but in man it is vaſculous and fibrous. What authors have deſcribed as glands in the ſpleen, Ruyſch has proved to be only veſſels. There is, indeed, often found a lymphatick gland or two, of about the bigneſs of a bean, without the ſpleen, near where the veſſels enter into it; but the ſubſtance of the viſcus itſelf is not to be ſuppoſed glandulous for that reaſon.

The uſe of the ſpleen has been much controverted by authors. The moſt probable opinion ſeems, that it is to render more fluid the blood, out of which the bile is afterwards to be ſecreted, which is naturally thick; and that by this means obſtructions, which muſt otherwiſe be frequent, are prevented, and the ſecretion of the bile is promoted.

The kidneys.

219. The kidneys, *renes*, are two red viſcera, of an oblong figure, reſembling, in ſome degree, that of a kidney-bean. They are ſituated at the loins, one on each ſide; and their hollowed ſide is turned inward, their convex ſide outward.

They are ſituated near the two loweſt ſpurious ribs: but this is not exactly regular; for they are in ſome ſubjects a little higher, and in others a little lower: and one of them is not unfrequently placed a little above the other. Sometimes they are perfectly even: it is not always the ſame kidney that is placed higheſt; but ſometimes the right, ſometimes the left is ſo. The kidneys are connected with the loins, the lower ribs, the colon, the ſuccenturiati, the renal veſſels, and the ureters. They have two membranes, the one robuſt and common, called the adipoſe membrane: this ſurrounds them but looſely, and is furniſhed with its own proper veſſels. The other membrane is proper, and is very thin, and every where applied cloſely to the ſubſtance of the kidneys.

The length of the kidneys is five or ſix fingers, the breadth three, and the thickneſs about a finger and a half. The ſurface is, in adults, ſmooth and equal; but in the fœtus in human ſubjects, and in the grown animals of many other kinds, it is irregularly divided, as it were, into a number of lobes.

The veſſels of the kidneys are included, as thoſe of the liver, in a membrane, from the peritonæum, or a kind of capſule. The arteries and veins are large, and are called emulgents and renal veſſels: they are produced from the aorta and the vena cava. The nerves are from the plexus renalis; and there is a large excretory duct called the ureter. There are alſo a number of lymphaticks, paſſing to the receptaculum chyli. The ſubſtance of the kidneys is firm and hard, and is of two kinds. 1. The exterior, or cortical, which, according to Malpighi, is glandulous; but, according to the diſcoveries of Ruyſch, is throughout elegantly vaſculous *. 2. The interior, which is tubulous, and expreſſed by the name of tubuli urinarii Bellini: this terminates in ten or twelve papillæ, which open by a multitude of apertures into the pelvis †; but theſe papillæ are not found in all ſubjects §.

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* See Ruyſch's Theſaur. Anat. 3. T. 4. fig. 2, and 3; and his Theſ. 4. T. 1. fig. 1.

† See Ruyſch's Theſ. 3. fig. 3. and Theſ. 3. T. 1. fig. 1.

§ See Schelham, Anal. Diff. 11.

The pelvis is a membranaceous cavity, ſending out ſeveral proceſſes, called the tubuli of the pelvis, and ſurrounding the renal papillæ.

The uſe of the kidneys is to ſecrete the urine from the blood into the pelvis, and ſend it thence by the ureters into the bladder.

Succenturiati. 220. The renes ſuccenturiati, called alſo glandulæ renales, and by ſome capſulæ atrabiliariæ, were firſt deſcribed by Euſtachius *. They are two yellowiſh glands, of a compreſſed figure, lying on each ſide of the upper part of the kidneys. They have a very narrow cavity, imbued with a browniſh liquor of a ſweetiſh taſte.

Their figure is irregular, between ſquare, triangular, and oval: ſometimes it is nearly one of theſe, ſometimes very different from them all. Their ſize alſo is various; but in adults they are, in general, about the bigneſs of large nux vomica. In the fœtus they are larger, and often exceed the kidneys themſelves in ſize. The membrane that ſurrounds them is very thin: it cloſely involves their whole ſubſtance, and connects them with the kidneys.

Their blood-veſſels are ſometimes ſent from the aorta and vena cava; but more frequently they are from the emulgents: their nerves are from the plexus renalis, and their lymphatick veſſels are numerous. There is no excretory duct diſcovered in them, and their uſe is therefore not certainly known. By their great ſize in the fœtus, they ſeem deſtined rather to the ſervice of that ſtate than of any other.

The ureters. 221. The ureters are two membranaceous tubes, or pipes, nearly cylindrick in figure, and of about the thickneſs of a quill; but their diameter is very uncertain. They ariſe from the kidneys

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* See Euſtachius, lib. de Renibus.

neys, one ſrom each; and terminate in the urinary bladder. At their origin in the kidneys, they are expanded into the ſorm of a funnel; and this expanſion makes the pelvis of the kidneys, already mentioned. At their termination, which is in the hinder and lower part of the bladder, they paſs obliquely in between its membranes, and open into the bladder by very narrow orifices, and can admit nothing into them from the bladder. They are not ſtrait, but ſomewhat bent, ſo as to reſemble the letter S. Their ſubſtance is membranaceous, and they are compoſed of three coats: the firſt, a common one from the peritonæum; the ſecond, a thin muſcular one; and the third, a nervous one, covered with a lubricous humour, and in this there are ſometimes diſcovered glands *. The blood-veſſels and nerves come from the adjacent parts. The uſe of the ureters is to receive the urine, ſecreted in the kidneys, from the pelvis, and to carry it to the urinary bladder. When theſe are obſtructed, a ſuppreſſion of urine is the conſequence; for there is no other way for the urine to get into the bladder, but thro' them.

They are often found of an unnatural ſize, owing to ſtones concreted from among the urine †.

222. The urinary bladder is a membranaceous hollow body, of the figure of a pear, ſituated in the pelvis, and deſtined to collect, and, at a proper time, to expel the urine. Its ſize is ſuch, that it will conveniently hold about a pint in adults; but it is capable of diſtenſion, ſo as to hold much more. It is, in the human body, connected in a

The bladder.

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* See Ruyſch's Obſerv. 15. and Morgagni's Adverſ. 3. 71.

† See Ruyſch's Obſerv. 15. and Cockſwith's Diſſertat. de Valv. Uret.

ſingular manner by the peritonæum to the os pubis, otherwiſe than in other animals. It is alſo connected with the parts of generation by the urethra, with the navel by the urachus and umbilical arteries; and finally, in men, with the inteſtinum rectum; and in women, with the vagina.

It is divided into three parts, the body, the neck, and the fundus or bottom: the coats of the bladder are much thinner in the body, and the fundus, than they are at its neck. Its blood-veſſels come from the hypogaſtrick, the umbilical, and the hæmorrhoidal veſſels in men; and in women, from the ſpermaticks alſo. Its nerves are from the intercoſtals, and principally from thoſe of the os ſacrum. Its lymphaticks were diſcovered by Zeller *.

Its ſtructure is membranaceous, and conſiſts of three coats or membranes. The firſt is called the common membrane: this is continuous with the peritonæum, and ſurrounds only the bottom of the bladder †; and there is uſually ſome fat found under it. The ſecond coat is muſcular, and is compoſed of ſeveral ſeries of fibres, running in various directions, but principally longitudinal and tranſverſe. The third or inner coat is nervous, and is covered with a peculiar fluid of a mucous nature, which is ſecreted in glands ſituated in this coat, and principally in that part of it which is near the neck of the bladder §.

The ſphincter of the bladder is compoſed of a ſeries of tranſverſe fibres, running croſs-wiſe under the ſtrait fibres of the neck of the bladder, in form of a circle, and ſerving to cloſe it, to prevent

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* See Zeller's Diſput. de Adminiſtr. vaſ. lymph. p. 3.

† See Cheſelden's Lithotomy.

§ See De Graaf de Organ. Generat. T. 5. and Drake's Anthropolog. T. 3. fig. 1.

vent the involuntary diſcharge of the urine. In man this is connected to the fibres of the inteſtinum rectum; and in women, to thoſe of the vagina.

The foramina of the urinary bladder are three; two where the ureters enter in, at which the urine is thrown into the bladder; and one, much larger than theſe, in the neck of the bladder, for the diſcharge of the urine out into the urethra. The uſes of theſe apertures are too obvious to need explanation.

The urethra.

223. The urethra is a tube, or canal, of a membranaceous ſtructure, and nearly of a cylindrick figure. It is continuous with the neck of the bladder: it ſeems to give paſſage to the urine out of the bladder. In women it is ſcarce two fingers breadth long: in men it is much longer. But of this, more in the deſcription of the parts of generation.

CHAP. III.

Of the parts of generation in men.

Teſticles.

224. IN our examination of the parts of generation in men, we are to obſerve, firſt, the teſticles: theſe are two, and are contained in a peculiar bag, called the ſcrotum. Their figure and ſize are ſufficiently known. Their coverings are of two kinds, common and proper: in regard to theſe, we are firſt to obſerve the ſcrotum. This hangs down below the penis; and, in adults, is in part covered with hair. It has a longitudinal ſuture, by which it is divided into two ſides, a right and a left. It is compoſed of the cuticula cutis, and a muſculous membrane, called the dartus, by means of which it is contracted. It

has in the midſt a ſeptum, formed of the dartus, by a duplicature of it, and dividing the ſcrotum into two cells. Ruyſch and Ravius have treated largely and accurately of this ſeptum. It has its veſſels from the pudenda and hypogaſtricks; its nerves from the os ſacrum. Its uſe is to contain and cheriſh the teſticles.

Beſide this external covering, the teſticles themſelves have three coats, or tunics: the firſt compoſes the cremaſter muſcle, the office of which is to raiſe the teſticle. The ſecond is the vaginalis tunica, formed of a proceſs of the peritonæum, and laxly ſurrounding the teſticle. And the third is the tunica albuginea: this is robuſt and ſtrong, and adheres cloſely to the ſubſtance of the teſticle. This receives the ſpermatick veſſels, and conveys them to the teſticle.

The veſſels of the teſticles, beſide thoſe already named, as common to them and to the ſcrotum, are, 1. The ſpermatick arteries, which ariſe from the aorta by a very narrow origin. 2. The veins, the right one from the cava, the left uſually from the left emulgent: theſe have no valves; and they make many anaſtomoſes in their courſe, and form what are called the corpus pampiniforme, and corpus pyramidale. Their nerves ariſe from the plexus of the nerves of the pelvis, and of the loins. There may alſo be diſcovered in them a great number of lymphaticks, if they be examined in an animal yet living; otherwiſe it is not ſo eaſy to ſee them.

The ſubſtance of the teſticles is vaſculous. They are compoſed of a great number of extremely minute veſſels, called vaſcula ſeminalia, which are convoluted about one another, in the manner of the inteſtines*. Theſe appear very beautifully, after macerating the teſticles in vinegar. There are no glands in them.

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* See Cheſelden's Anatomy, T. 28. and Ruyſch's Theſaur. 4. T. 1. fig. 2. and Theſaur. 8. T. 3. fig. 3.

There is alſo a body, called, from the diſcoverer, corpus Highmori, in which there is a cavity formed for the reception of the ſemen. This in human bodies, is placed on the back of the teſticle; but in dogs, and many other animals, it is in the middle of them *.

The uſe of the teſticles is to produce the ſemen maſculinum for generation. In this liquid there have been diſcovered, by the microſcope, multitudes of minute living animals †.

225. The epididymides, or paraſtatæ, are two in number; one to each teſticle. They are oblong, nearly of a cylindrick figure, reſembling, in ſome meaſure, the body of a caterpillar or ſilkworm, and laid on the upper circumference of the teſticle. They are connected with the teſticles, by means of the tunica albuginea, and alſo with the vas deferens. De Graaf has treated largely and accurately of theſe, as well as of the other parts of generation. Their origin is in the teſticles, by five or ſix very ſmall ſeminal veſſels; and their termination is in the other extremity of the teſticle, where the vas deferens begin. They are ſurrounded by a robuſt membrane, which is continuous with the albuginea of the teſticle. They are compoſed of veſſels, in the ſame manner as the teſticles; but the veſſels they are compoſed of, are much more conſpicuous than thoſe which form the ſubſtance of the teſticles; and they are capable of being elegantly filled by injections. All theſe veſſels terminate in one duct at laſt, and

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* See Highmore's Anat. T. 10, and 11.

† See Lewenhoek in the Philoſophical Tranſactions, Boerhaave's Inſt. Med. and Valliſnieri de Generat. T. 1. and Cheſelden, T. 28.

this duct is what is called the vas deferens. Their veſſels are the ſame with thoſe of the teſticles, and are called ſpermaticks. Their nerves proceed from the ſame branches with thoſe of the teſticles. Their uſe is to receive the ſemen from the teſticles, to farther elaborate and perfect it, and, finally, to convey it into the vas deferens.

Vas deferens.

226. The vas deferens, called alſo by ſome, from its office, vas ejaculatorium, is a robuſt tube, of a whitiſh colour, reſembling a nerve. It is of the thickneſs of a moderate ſtraw. One of theſe veſſels is carried from each of the epididymides to the veſiculæ ſeminales, and the urethra.

The progreſs of the vas deferens is thro' the proceſs of the peritonæum up to the abdomen; and after this, down again to the urethra, bending back about the neck of the bladder. It terminates in the anterior part of the veſiculæ ſeminalis, partly running ſtrait into the urethra, and partly obliquely into the veſiculæ ſeminales: by this means it diſcharges its contents, as the occaſion requires, either into the veſiculæ ſeminales, or immediately into the urethra.

Its ſubſtance is robuſt, ſtrong and tough, and much like that of the nerves. Its cavity, at the origin, is ſcarce large enough to admit a hog's briſtle; nor does it much increaſe in the progreſs of the veſſel, till it comes near the bladder; but it then grows much larger: and after this, toward the extremity, it is very narrow again; ſo that it never emits any thing into the urethra, except under the circumſtances for which it was deſtined, that is, in coition.

The uſe of the vaſa deferentia is to carry the ſemen maſculinum from the epididymes continually to the veſiculæ ſeminales, and in the coitus to diſcharge it into the urethra: probably alſo, it has ſome ſhare in the elaborating and perfecting that important fluid.

227. The veſiculæ ſeminales are two membranaceous cellular receptacles, joined to the poſterior part of the neck of the bladder, and deſtined for the reception of the ſemen from the vaſa deferentia, for the farther elaborating and perfecting that fluid, and for the diſcharging it at a proper time into the urethra, in order to its being thrown out to do its deſtined office in impregnation. Veſiculæ ſeminales.

The veſiculæ ſeminales are in length about three fingers breadth, and in breadth about one. They are compoſed of a ſtrong, vaſculous, and, as it were, muſculous membrane, which forms a number of cells, communicating with one another, and ſurrounded with a robuſt part of the peritonæum. Theſe cellules may, however, all be reſolved into one, as it were *.

The excretory duct of the veſiculæ ſeminales is double. There is one from each veſicle, and it ordinarily terminates by a double orifice into the urethra. Leal is very erroneous, when he deſcribes only one duct, and one aperture †.

The veſiculæ ſeminales have arteries and veins in great plenty, from the veſſels of the bladder, and of the rectum. The nerves they have are from the plexus of the pelvis: their internal ſurface is wrinkled, and, as it were, reticulated like that of the veſica fellea, or gall-bladder §. There are not wanting authors who affirm, that there are glands in this part; but they are not eaſily ſeen.

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* See Leal de Part. Sem. Conf. fig. 2.

† See the ſame, p. 27.

§ See Santorini, p. 201.

The proſtatæ. 228. The proſtatæ, or, as it might be more properly written, the proſtata; for the two bodies, as they are called, of this name, form really but a ſingle one; is of a roundiſh, or ſomewhat heart-faſhioned ſhape; and is ſituated juſt before the neck of the bladder, and ſurrounds the whole beginning of the urethra *. In ſize it is about equal to a wall-nut; and it has two prominences of a round figure in its hinder part, called prominentiæ natiformes. Its eminence, called the caput gallinaginis, is in the urethra, and has two orifices, which are common to the veſiculæ ſeminales, and the ejaculatory ducts; and not unfrequently, there is a little ſinus alſo between theſe †.

The ſubſtance of the proſtatæ is glandulous and cavernous: it is very robuſt, and is ſurrounded by a ſtrong membrane. The foraminula, or excretory ducts of this gland, diſcharge from the little cells, that are in it, a thin white fluid. In the human body there are ten or twelve of them: in dogs they are greatly more numerous. The veſſels of the proſtata are common with the veſiculæ ſeminales.

The uſe of the proſtata is to ſecrete a whitiſh fluid, which, becauſe it is ejected in coition, ſome have ſuppoſed to be of uſe in generation: but this is evidently not the caſe; for eunuchs have it, and diſcharge it as others do. It ſeems deſtined by nature to lubricate the urethra, and to be a kind of vehicle to the ſemen, which is too thick otherwiſe to paſs with the neceſſary eaſe.

The penis. 229. The penis comes next under conſideration. This is, in man, the primary organ of generation. It is called alſo mentula, virga, priapus, and by a multitude of other names. Anatomiſts

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* See Cheſelden's Lithotomy, T. 6.

† See Morgagni's Adverſar. 4. p. 6. fig. 1, and 2.

tomiſts divide the penis into three parts, the body, the glans, and the urethra.

In the body of the penis we are to obſerve the cuticle, and cutis, as the common teguments. After theſe we are to examine the prepuce, which is a duplicature or replication of the cutis, covering the glans: in the lower part of this is fixed the frænulum, and both theſe are thickly beſet with nervous papillæ, and little veſicles or folliculi, commonly ſuppoſed to be glands, but not truly ſuch. Theſe follicules are what Du Tyſon calls glandulæ odoriferæ *.

After this we are to obſerve the proper tegument, or coat of the penis. This is a robuſt coat, of a membranous nature, ſurrounding every part of the penis. It is ſometimes double; and has, in the interſtitial ſpace, a cellulose coat, which is diſcoverable by inflation, and drying in that ſtate †.

Under this are the two bodies which conſtitute the penis: theſe are called corpora ſpongioſa, and corpora cavernoſa. They ariſe diſtinct, and ſeparate on each ſide from the oſſa pubis, as it were, from peculiar thalami §. After this they join, and in that original ſtate are carried on to the glans. If any liquid be impelled into theſe, or if they be inflated, the penis becomes rigid. Between theſe two bodies is a ſeptum, which riſes from the conjunction of the parietes of theſe bodies. It is thicker in the hinder than in the anterior part, and is perforated in the manner of a ſieve.

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* See Cowper's Myotom. reform. p. 228.

† See Ruyſch, Epiſt. 15. T. 19. but he owns this celluloſe tunic is not always to be found.

§ See Santorini, p. 188.

The penis is joined by ſynchondroſis to the oſſa pubis by means of a ligament, called ligamentum veſalii *, as alſo by its lateral ligaments.

The muſcles of the penis are numerous: they ſerve principally for the erecting it; but theſe are to be treated of hereafter in the myologia.

The veſſels of the penis are very numerous, and are diſtributed thro' it in a very ſurpriſing and beautiful manner. See them delineated Tab. 5.

The glans, called alſo the head, and the balanus of the penis, is its anterior extremity. Its ſurface is very ſmooth and polite; and it is very ſenſible to the touch, which is owing to a multitude of nervous papillæ diſtributed all over it, and moſt obvious when the penis is erected. In the front of this is the aperture, or extremity of the urethra: this is ſmaller than the reſt of the cavity of the urethra; and immediately under this is inſerted the frænum, or frænulum of the penis.

The poſterior extremity of the glans, with its neck behind, is diſtinguiſhed by the name of the corona. In this part ſome authors ſay they have diſcovered a number of minute glands †; but Santorini does not allow what they call ſo to be glands: he ſays, they are only the mouths of excretory ducts.

The glans is compoſed of the epidermis and the corpus cavernoſum, which is continuous with the urethra; and in this part is expanded, as it were, into a kind of bulb or globe §. The coat of the penis is alſo added to theſe ‡.

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* See Morgagni, Adverſ. Anat. 1. T. 4. fig. 4.

† See Littrius Hiſt. Acad. Reg. Par. 1700. and Morgagni Adverſ. 1. T. 4. fig. 4.

§ See Ruyſch Obſ. Anat. 100.

‡ See Santorini, p. 191.

The urethra is a membranaceous tube or canal, nearly of a cylindrick figure, continuous to the neck of the bladder, and extended to the extremity of the glans. Its office is to give paſſage to the ſemen and urine.

The urethra is ſituated in a kind of furrow, formed between the two corpora cavernoſa, in the bottom or lower part of the penis. It does not run perfectly ſtrait; but is bent in a very ſingular manner *. Its length is twelve or thirteen inches, from the neck of the bladder to the extremity of the glans. Its cavity is as large as that of a gooſe-quill. It is compoſed of two robuſt membranes, an exterior and an interior: their ſubſtance is firm and tough; and between them there is a ſpongeous or cavernous matter, in which ſome authors pretend to have diſcovered glands: but this is uncertain †.

The bulb of the urethra is next to be examined. This is that part of it which is next to the proſtatæ: it is much thicker than the reſt of the tube, and is about an inch long, and in ſome meaſure reſembles a wall-nut. It is of a thick and ſpongy texture.

The interior ſurface of the urethra is full of roundiſh and oblong foraminula and furrows, out of which there may often be preſſed a thick, viſcous fluid: the uſe of this is to lubricate the urethra, and to defend it from the acrimony of the urine ‡.

230. To the conſideration of the penis, there yet alſo belong the glands, called, from their diſ-

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* See Alghiſius's Lithotom. and Morgagni Adv. 3. p. 82. where they are better expreſſed.

† See Terran. lib de Gland. p. 32.

‡ See Morgag. Adverſ. 1. T. 4. fig. 4. c. See alſo Littr. nov. Urethra Deſcriptio.

coverer,

Glandulæ Cowperi. coverer, glandulæ Cowperi mucoſæ. He deſcribes three of them *: two of them are ſituated regugularly one on each ſide the urethra, between the muſculi acceleratores and the bulb. They are ſaid to be of an oval figure, but ſomewhat compreſſed, and are of the ſize of a horſe-bean. They ſecrete a mucous pellucid liquor, which each diſcharges at its own duct into the urethra. Theſe ducts are ſeparate and diſtinct, and are about two fingers breadth long, and perforate at their extremities the coats of the urethra. The uſe of the fluid, which they ſecrete, ſeems to be to lubricate the urethra, and to defend it from being hurt by the acrimony of the urine. Cowper is too accurate and faithful a writer, to have deſcribed parts which he did not find: but anatomiſts, ſince his time, have often failed of them; ſo that either there is ſome error in the account, or they are not univerſal in all ſubjects.

The third of them, which is ſingle, is in the angle of the curvature of the urethra, under the os pubis, and within the corpus ſpongioſum, or cavernoſum of the urethra. Such is the account of its ſituation given by Cowper; and he has figured it of the ſize of a ſmall pea: but this alſo is wanting in bodies diſſected by our beſt anatomiſts.

Glandula Littrii. 231. Finally, we are to obſerve the glandula Littrii †. This is a gland ſituated juſt below the proſtata, and lodged between the two membranes or coats of the urethra. It is of a duſky rediſh colour, and is an inch broad, and about a ſixth of an inch thick. It ſurrounds the interior membrane of the urethra, in the manner of a zone; and, perforating it with ſeveral ſmall foraminulæ, it pours into it a mucous liquor; the office of which

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* See Cowper's Deſcr. Gland. nuper detect. 4to, London.

† See Terran. de Gland. p. 65.

which is, like that of the other liquors of the ſame kind already mentioned, to lubricate and defend the urethra.

232. The veſſels of the penis, urethra, and theſe glands, are in common. Their arteries are from the hypogaſtricks, and thoſe of the pudenda. The veins, which all have valves, carry back the blood to the veins of the ſame parts; but, before they join them, they make various anaſtomoſes, and form a wonderful kind of reticulation in the body of the penis, and under the oſſa pubis. Santorini has well deſcribed this wonderful implexity of them, and calls it the labyrinth. The nerves come from the laſt of thoſe of the os ſacrum; and the lymphatick veſſels are numerous, and are beautifully delineated by Cowper and Drake †.

233. The uſes of the penis are two, a primary and ſecondary. The primary uſe of it is to ſerve in the office of generation: the ſecondary, for the excretion of the urine.

CHAP. IV.

Of the parts of generation in women.

234. FROM the examination of the parts of generation in men, we are to paſs to thoſe of women. Theſe are divided into the external and internal. The external parts, or thoſe which may be ſeen without diſſection, are theſe:

Parts of generation of women.

The pudendum, or vulva; in the midſt of which is an opening, and the orifice of the vagina: at the lower part is the frænulum, and the perinæum.

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* See Memoirs of the Paris Academy, 1700.

† See Cowper's Myotom. reform. fig. 10. and Drake's Anthropolog. T. 6.

The labia are two; and over them is the mons veneris, which is tumid, from ſome fat that is within it, and is covered with hair.

The clitoris.

The clitoris, or, as ſome call it, mentula muliebris, is ſituated in the upper part of the aperture, and, in its common ſtate, is almoſt entirely buried under the ſkin or prepuce. Its general ſize is about that of the uvula, or ſcarce ſo much: its ſhape alſo much reſembles that of that part; but it ſometimes is found of an extraordinary bigneſs, as large as the penis *: but in this caſe it has no urethra. It has a glans, or apex, as the penis has; but this is not perforated: it is uſually covered with a fœtid matter, like that of the glans of the penis †. The prepuce, covering the glans of the clitoris, is formed of the cutis of the pudendum, and furniſhed with nervous papillæ: hence it is of exquiſite ſenſibility to the touch. It has alſo a ligament, by which it is connected to the oſſa pubis, in the ſame manner as the penis is in men §. It has two crura, or legs, which run from the oſſa pubis, and are three times as long as the clitoris, in its natural ſtate. It has alſo its two cavernous or ſpongious bodies, with a ſeptum between them, which conſtitute its body, very much as in the penis, and theſe are ſurrounded with a nervous membrane.

There are two erector muſcles alſo belonging to the clitoris, like thoſe of the penis: theſe ariſe from the oſſa iſchii, and are inſerted into the corpora cavernoſa. The veſſels are common to this,

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* See examples of this in Panarollus, Platerus, De Graaf, Tulpius, and others.

† See Santorini, p. 191.

§ See De Graaf de Mulierum organis, cap. 3. and alſo Morgagni Adverſ. p. 20.

and to the other external parts. The arteries and veins come from the hypogaſtricks, and thoſe of the pudenda; and the nerves from the os ſacrum. Several very large ramifications of theſe run along the back of the clitoris; and hence it is, that it is all over of ſuch exquiſite ſenſe.

Its uſe is to produce a titillation in the coitus, and to increaſe the pleaſure.

The nymphæ come next under conſideration. Theſe are two membranaceous parts, ſituated on each ſide the rima. They are of a red colour, and cavernous ſtructure, and ſomewhat reſemble the wattles under a cock's throat. They are ſometimes ſmaller, ſometimes larger, and are continuous to the præputium of the clitoris, and joined to the interior ſide of the labia. In theſe we are to obſerve the nervous papillæ, which are very copious, whence their quick ſenſe; and their ſmall glands, which ſecrete a fatty matter *. The uſe of the nymphæ is to increaſe the pleaſure in coition, and to direct the courſe of the urine.

The nymphæ.

We are next to obſerve the orifice of the vagina, or the os uteri externum. This is ſurrounded with a cavernous ſubſtance, which ſwells in the time of coition: it is very ſmall in virgins, larger in thoſe who have had commerce with man, and much larger ſtill in ſuch as have borne children. It is always, however, much ſmaller than the reſt of the vagina.

The hymen is a membrane, ſometimes of a circular, ſometimes of a ſemi-lunar figure, and ſometimes of a form different from both †. It is always

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[*] See Morgagni Adverſ. 1. T. 3. let. ee.

[†] See Morgagni Adverſ. 1. T. 3. in gg; and Santorini, T. 2. fig. 1. e. Our author found it in a girl of fourteen, juſt as there deſcribed.

always found in young ſubjects, and ſtops a part of the paſſage of the vagina. It has a ſmall aperture in girls, and a larger in adults, who have not converſed with men: After the firſt coitus it is not to be found: it is always deſtroyed by it; and, if it have not been injured before, always ſome blood follows the rupture of it.

The carunculæ myrtiformes owe their origin to the breaking of the hymen: they are, therefore, not to be found in ſubjects in which that membrane exiſts intire. They are two, three, or four in number, and are placed where the hymen was.

The urethra, or urinary paſſage, is ſituated ſtrait under the clitoris, and ſhews itſelf by a little eminence. Its length is about two fingers breadth: its diameter is greater than in man; but ſomewhat narrower at the end than elſewhere: it is capable of great dilatation. There are in it certain little ducts, which convey to its inner ſurface a mucous humor, for lubricating and defending it from the acrimony of the urine; but their origin is uncertain *.

Finally, we are to obſerve the lacunæ of De Graaf: theſe are certain little oſcula, viſible about the urethra; and are ducts which ſerve to excrete a mucous humour, to lubricate the vagina. Theſe ariſe from the corpus glandoſum of the urethra †.

The vagina.

235. The internal parts of generation in women, are theſe:

The vagina, which is a large canal, not unlike the inteſtinum rectum; but more robuſt and ſtrong. It is extended from the orifice, already mentioned, to the uterus. It runs between the rectum and the urinary bladder, and adheres to

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* See Morgagni Adverſ. 1. S. 10. and 4. p. 44. See alſo Terran. de Gland. p. 44.

† See Morgagni Adverſ. T. 1. fig. 3.

both of them. Its natural length is about ſix or ſeven fingers breadth; but it is very diſtenſible. Its diameter is naturally about equal to that of one of the ſmall guts; but it is capable of great dilatation, eſpecially in the time of delivery. Its orifice is narrower than any other part of it, and is cloſed with a ſphincter. Its ſubſtance is membranaceous; and it is within rugoſe, and furniſhed with abundance of nervous papillæ: and to this is owing its quick ſenſation. Externally it is muſcular, and by that is enabled to embrace the penis more cloſely in coitu.

Its upper part is connected with the bladder, its lower with the rectum, and its hinder extremity with the uterus. The wrinkles of the vagina are not circular, but rather as in the gut jejunum. They are largeſt and deepeſt in maids, and eſpecially in the anterior part of the vagina. In people who have been much addicted to venery they are fainter, and ſeem as if worn down. In women who have borne children, they are almoſt intirely obliterated.

Their uſe is to increaſe the pleaſure in coitu, both to the man and the woman, and to render the part capable of the neceſſary dilatation in parturition.

There are found certain lacunæ, or oſcula, about the orifice of the vagina; ſuch as there alſo are about that of the urethra. Theſe often are ſo large as to admit a briſtle; and they have their origin from the glandulæ ſubſtratæ, the proſtatæ of Bartholine. Their uſe is to ſecrete a fluid for the lubricating the vagina, and for ſtimulating to venery *.

The ſphincter, or contracting muſcle of the vagina, is compoſed of a ſeries of muſcular fibres,

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* See Morgagni Adverſ. prim. S. 31. T. 3.

ariſing from the ſphincter of the anus, and ſurrounding the orifice of the vagina; after which it is inſerted under the crura of the clitoris. The corpus cavernoſum alſo ſurrounds the orifice in the ſame place; and this being liable to diſtention, with the blood, at the time of the coitus, aſſiſts in preſſing upon the penis.

The uſe of the vagina is to receive the penis and the ſemen, and to emit from the womb the menſtrual diſcharges, the fœtus, the ſecundines, and the lochia.

236. The uterus, called alſo the matrix, is a hollow body, of a form approaching to that of a pear, ſituated between the bladder and the rectum, and deſtined to the office of generation, for the containing the fœtus. In this we are to obſerve,

Its connections in the anterior part with the vagina; and in its lateral part by the ligaments, which are of two kinds: its hinder part is looſe.

Its two kinds of ligaments are the lata and rotunda. The ligamenta lata, or broad ligaments, are of a membranaceous ſtructure: they are continuous with the peritonæum; and they join on each ſide the uterus, and the vagina, to the parietes of the pelvis. They conſiſt of a double membrane, between which is lodged a cellular ſubſtance, as in the meſentery. This is eaſily ſhewn on inflation.

The ligamenta rotunda have their origin from the upper part of the uterus: they paſs thro' the annules of the muſcles of the abdomen, and are terminated in the fat, near the groins. They are compoſed of a double membrane, with a plexus of veſſels *, and a multitude of irregular fibres.

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* See Morgagni Adverſ. 4. p. 49, 50.

Theſe are moſt diſtinctly ſeen in women with child *.

In women not with child, the length of the womb is about three inches: its breadth, in the upper part, is about two; and in the lower, it is about one. Its thickneſs is about an inch and a half: in virgins it is often much ſmaller than this; but in women with child, it is of a different ſize, according to the different time. Anatomiſts divide it into two parts: the upper and broader part they call the fundus uteri; the lower, they call the cervix. In this it is the vagina opens.

The orifice, or, as it is otherwiſe called, the internal mouth of the womb, opens into the vagina, in form of the glans penis in man. It is very ſmall in virgins; but in women who have had children, or who are but with child, it is larger: and in the laſt, it is always cloſed up with a glutinous humor. In the time of delivery it in a wonderful manner expands itſelf, ſo as to give paſſage to the child.

The ſubſtance of the womb is muſculous: it is compoſed of a various plexus of fleſhy fibres, with a great number of veſſels between. In women not with child, it is compact and firm: in thoſe who are with child, it is ſpongy and ſinuous, and is capable of wonderful dilatation, without any diminution of its thickneſs. It is covered externally with a membrane from the peritonæum: internally its cavity is lined with a porous and nervous membrane. This cavity is very ſmall in virgins †; and in women with child, the inner membrane almoſt intirely diſappears §.

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* See Santorini, Obſ. p. 200.

† See Morgagni, Adverſ. 1. T. 3.

§ See the ſame Adverſ. 4. p. 47.

The blood-veſſels of the uterus are tortuous, and make a thouſand anaſtomoſes with one another: in women with child, they are dilated into a kind of ſinus's *. They open by a number of little mouths into the uterus and vagina, and are the ſources of the menſtrual diſcharges in women.

The arteries are of three kinds: 1. Spermaticks from the aorta. 2. Very large ones from the hypogaſtricks. And, 3. Others from the hæmorrhoidal. Theſe all communicate, in a ſurpriſing manner, with one another; ſo that, if they be but inflated, or mercury or wax be injected into any one of them, they are all filled in an inſtant; even thoſe on the oppoſite ſide, as well as thoſe of that on which the injection is thrown in. The veins of the uterus are alſo of three kinds, and of the ſame denominations: they have no valves, and are greatly larger than the arteries, eſpecially in women with child. Air may often be thrown into the cavities of the uterus and vagina, by inflating theſe: and, on the contrary, theſe veſſels may often be inflated alſo, by means of air thrown into the vagina and uterus †. The nerves of the womb are from the intercoſtals, and thoſe of the os ſacrum. The vaſa lymphatica have long ſince been diſcovered in brutes; but, of later years, Morgagni has found them alſo in human ſubjects, in the ſtate of pregnancy ‡. The lymphaticks, commonly figured in the womb by authors, are not from nature.

In the cervix, or neck of the womb, there are a number of little openings, with folds or valves between them §. Theſe ſeem to be ducts, ſerving

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* See Morgagni, Adverſ. 4. p. 48. and Vater. de Utero.

† See Fanton. Anat. corp. hum. p. 186. See alſo Vater.

‡ See his Adverſar. 4. p. 76.

§ See his Adverſar. 1. T. 3.

for the ſecretion of a mucous fluid. There are alſo ſometimes obſerved in the orifice, and neck of the womb, certain veſicles, or corpora globoſa*: theſe contain a mucous fluid, and have been taken by many for hydatides †. Some have ſuppoſed them glands ‡, and that they ſecrete that mucous fluid, which, in women with child, cloſes up the mouth of the womb. Others have given them a much nobler office, calling them the new-diſcovered and true ovaries, and ſuppoſing the fœtus formed in them §. And ſome will have them to be the veſiculæ ſeminales of the female ſex ||; and that a prolifick ſemen is diſcharged from them in the time of coition. Theſe laſt opinions are evidently fartheſt of all from truth; but what their real uſe is, is yet doubtful. They are much more obvious in women with child, in whom they ſtand very cloſe ¶.

Ovaria.

237. The ovaria, called, by the earlier writers, teſtes muliebres, are two bodies of a ſomewhat globoſe figure, of a ſmooth ſurface, and in colour whitiſh: they are annexed, one on each ſide, to the fundus of the womb.

They are connected, 1. To the fundus uteri, by means of the ligamentum teres; a ligament of a cylindrick figure, which the earlier writers uſed

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* See them delineated in the ſame place.

† See the authors cited by Morgagni, Adverſ. 1. p. 32. And Ruyſch, Adverſ. Anat. decad. p. 5.

‡ See Morgagn in the ſame place; and Verheyen, l. c. cap. 32.

§ See Naboth's Diſſertat. de Sterilitate; and Fred. Hoffman in Medic. rational. T. 1. Againſt the opinion, ſee Goelick's Hiſt. Anat. p. 183; Etmuller's Epiſt. de Ovar. and Hilſcher's de Generat. p. 2.

|| See Letters of Deſnoves, p. 70; and Blegny's Zodiac, T. 1. p. 20.

┼ See Heinrici's Diſſert. de Veſic. ſeminal. mulierum.

¶ See Santorini, p. 213.

to ſuppoſe the vas deferens in women: but there is no paſſage from it to the womb, ſo that this opinion is evidently groundleſs. 2. To the Fallopian tubes, and to the ſides of the pelvis, by the ligamenta lata of the uterus, and the alæ veſpertilionum. And, 3. To many other parts, by means of the ſpermatick veſſels.

Their ſhape is nearly oval; but gibbous on the upper ſurface, and flat below.

Their ſize differs, according to the age and temperament of the ſubject. They are largeſt in perſons in the vigour of their age, and in ſuch as are addicted to luſt: in ſuch ſubjects they are found of two drams weight, and furniſhed with a number of prominent veſicles. In old people they ſcarce weigh ſo much as half a dram; and are dry, corrugated, and deformed with cicatrices.

The alæ veſpertilionum are membranes, placed between the tubæ Fallopianæ and the ovaries.

The ovaries are ſurrounded by a ſtrong white membrane from the peritonæum; and are of a membranaceous ſubſtance, fibrous, reticulated, and full of veſſels variouſly interwoven. Among theſe there are a number of round veſicles, with a yellow ſubſtance diſpoſed under them: theſe are more or fewer in number, according to the age and temperament of the perſon; and are filled with a ſubſtance, much reſembling the white of an egg: and this humor acquires alſo, on boiling, the hardneſs and conſiſtence of the white of an egg boiled. From this analogy with the eggs of birds, theſe veſicles were called by Hornius ova *, or ovula. The largeſt of them hardly equal a pea in bigneſs. There are ſometimes ten, fifteen, or twenty, or more than that, in one ovary:

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* Epiſt. de Genitalibus.

ſometimes there are only one or two of them. They are ſuppoſed to contain the firſt rudiments of the fœtus *.

There are often hydatides formed alſo in the ovaries; but theſe are morbid, and are often the cauſe of dropſies in women.

The bodies called corpora lutea, are a kind of glandulous ſubſtances †, of a yellow colour, contorted in the manner of the ſmall guts ‡, and diſpoſed under the ovula, which are contained, as it were, in their cavities. Theſe bodies may uſually be diſcerned in virgins; but in women with child they are much more obvious. Their uſe is uncertain §.

The Fallopian tubes.

238. The Fallopian tubes are two canals, tortuous in their figure, but approaching to a conic form. They are joined to the fundus of the uterus, one on each ſide. They were diſcovered by Fallopius, and named tubæ, from their reſemblance to ſome muſical wind-inſtrument of the trumpet kind.

They are connected cloſely and continuouſly to the uterus, and more laxly to the ovaries, by the alæ veſpertilionum; and, finally, to the oſſa ilei by the ligamenta lata. Their length is different: it is ſix, ſeven, or eight fingers breadth; ſometimes more. Their thickneſs, about the middle, is equal to that of one's little finger: their extremities are ſmaller: that next the uterus is very ſmall: it opens into its cavity, and may be inflated by blowing into the uterus; or a ſmall ſtyle may be thruſt up into it. This ſmall extremity

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* See Brendell de Embryone; and Valliſneri de Generat.

† According to De Graaf, Malpighi, Brendell, Berger, &c.

‡ See Valliſneri, and Santorini, p. 121.

§ Morgagn. Adverſ. Anat. 4. p. 51, and 78; and alſo Valliſneri and Santorini.

is connected to the uterus: the other is free, and fluctuates about in the abdomen. This is larger, and is fimbriated or fringed round the edges; and, when there is occaſion, this extremity applies itſelf to the ovary, embracing it with theſe muſcular ſegments or fringes. See their figure T. 3. Fig. 10, and 11.

Their ſubſtance is membranaceous and cavernous. They are compoſed of a double membrane: the exterior one ſeems to be continuous with the peritonæum; the interior, with the interior membrane of the uterus. They are wrinkled on the inner ſurface, and are imbued with a lubricous humor; but they are not cellulous in the human body, as in beaſts.

They are furniſhed with a great number of veſſels, and have a cavernous ſubſtance between their membranes, by means of which they are rendered rigid, on their applying their mouths to the ovary. They are alſo moiſtened, on their inner ſurface, by theſe veſſels *.

Their uſe in generation is very great. They become erect in the time of the coitus, from the influx of blood and ſpirits; and at that time, by a natural motion, they apply their looſe fringed extremities to the ovaries, which are ſurrounded and embraced by them: in this ſtate they convey to them the prolifick matter of the male ſemen, injected into the womb †; and after one of the ovula is thus impregnated, they receive it, and convey it to the womb ‡. This is the regular courſe of nature in the firſt effects of the coitus;

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* See Drake's Anthropolog. T. 10. fig. 2.

† See Ruyſch's Theſ. Anat. 5. T. 5. fig. 1. and his Adv. Anat. dec. 1. p. 3.

‡ Fœtus's are often found in this tube, and elſewhere out of the uterus. See Note 35.

but accidents of a thouſand kinds may impede this. The Fallopian tubes are eaſily diſcovered in hens, and other birds, and are called oviducts.

239. The uſe of the uterus is to admit the male ſemen; and afterwards to receive from the ovary, by means of the Fallopian tube, the ovulum impregnated by it. After this it retains the fœtus nine months, affording it nouriſhment; and, at the end of that time, it, by means of its own muſcular force, expels it thro' the os uteri and vagina.

240. After the impregnation there is a new production of parts in the female, which continues as long as the time of going with child. The principal of theſe is the fœtus *. The others are the membranes it is enveloped in; the placenta, the navel-ſtring, the umbilical veſſels, and the pellucid fluid contained in the membranes, in which the fœtus ſwims. All theſe are ſecondary to the great cauſe, and are produced merely for the ſake of the fœtus.

CHAP. V.

Of a Fœtus, and the parts appertaining to it.

241. IN the examination of the fœtus intire, we are to obſerve the membranes ſurrounding it in the uterus, as in an egg †. The exterior of theſe is the chorion: this is thick, ſpongy, villoſe, and furniſhed with a vaſt apparatus of blood-veſſels. It is contiguous to the uterus, and is ſeparable into two parts, or membranes.

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* See ſmall embryo's delineated in Ruyſch's Theſ. Anat. 6. T. 2. fig. 3.

† See Ruyſch's Theſ. 10. fig. 3. and T. 6. in this work.

The interior or ſecond membrane is called the amnios, and is very thin and pellucid. It is contiguous to the former; and has either abſolutely no veſſels, or at the utmoſt a very few, and thoſe very ſmall ones, are diſtinguiſhable in it. A pellucid and ſomewhat glutinous liquor is contained in this, and in that the fœtus. Both theſe membranes break at the time of delivery, and the liquor they contain flows out.

A third membrane is the allantois, called alſo by ſome membrana farciminalis. This is found in ſome animals, particularly in cows, very perfect, and continuous with the urachus, which is pervious; but it is not found in human ſubjects. It ſerves in thoſe animals for collecting the urine *.

Its length in a cow is near twelve foot, and its diameter, when diſtended by inflation, is more than a foot; ſo that it is an amazingly large and ſtupendous part. Many authors affirm, that it is equally neceſſary in the human frame as in that of the beaſts in which we find it; and hence they would conclude, that it alſo exiſts in women, tho' we do not diſcover it. Some of theſe authors ſay it is ſituated between the chorion and amnios; and others will have it to be within the amnios †. But as the moſt accurate of the modern anatomiſts have not been able to find it, and, added to this, as the urachus is not pervious in the human fœtus, at leaſt is uſually cloſed, and many other ſubſtantial reaſons might be alleged why providence ſhould relieve the human female from ſo vaſt an additional burthen in child-bearing, there is great reaſon to ſuppoſe, that there is no ſuch membrane, except in quadrupeds.

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* See our author's obſervations on the allantois, in the Ephemerid. N. C. cent. 6. obſ. 24.

† See Phil. Tranſ. N. 271. p. 835.

Authors in general have declared, that there are no blood-veſſels in the allantois of a cow; but our author has diſcovered an amazing multitude of them *.

The placenta.

242. After the membranes including the fœtus, we are to examine the placenta. This was called by the antients, from its reſemblance to the liver, hepar uterinum, the uterine liver.

The number of placentæ in human ſubjects anſwers to that of the fœtus's; as theſe are uſually ſingle, the placenta is uſually ſo alſo: when there are two or more fœtus's, there are always as many placentæ; but in this caſe they often cohere one to another, ſo as to ſeem but one ſubſtance; but, even in this caſe, their veſſels do not communicate from one to the other.

In quadrupeds, and particularly cows, there are often a great number of placentæ, ſometimes not leſs than a hundred to one fœtus. In this caſe they are called cotyledones. Fabricius ab Aquapendente has treated largely and accurately of them, in his book de Fœtu formato.

The figure of the placenta is orbicular; its diameter is eight or nine inches, and its thickneſs is about an inch. Its convex and ſpongy part is connected to the uterus, by means of a very thin and fine membrane, which is reticulated, villoſe, and continuous with the chorion. Its concave part is turned toward the fœtus, and ſhews a multitude of very large veſſels: it is joined to the funiculus, or navel-ſtring, and ſurrounded with a ſmooth membrane from the chorion and amnios. It has no fixed or certain part of the uterus to adhere to; but it uſually is affixed to its fundus or bottom, in which part Ruyſch diſcovered a

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* See them delineated in the Ephem. N. C. juſt mentioned.

new muſcle in pregnant females, compoſed of a ſeries of ſpiral fibres *.

The ſubſtance of the placenta, according to moſt of the later anatomiſts, is glandulous: they affirm, that it is compoſed of a multitude of minute glands; but they have not been able to demonſtrate them to the ſight. It ſeems more rational therefore to conclude with Ruyſch, and with thoſe who follow him, that it is truly vaſcular, or compoſed ſolely and intirely of the umbilical veins and arteries, interwoven with one another in a curious manner †. What uſe, indeed, could there be for glands in this part? The ſecretion of all that enters the placenta from the uterus has been already performed.

The uſe of the placenta is, 1. Together with the chorion, to abſorb the nutritious juices from the mother's uterus, as the inteſtines do the chyle §; and, finally, to tranſmit it to the fœtus, by means of the umbilical vein. And, 2. It probably ſerves to refund again to the parent the blood and urine of the fœtus, by the umbilical arteries.

243. After the placenta, we are to obſerve the umbilical veſſels of the fœtus, which, after the birth, degenerate into ligaments, as already mentioned, Chap. 207.

They are two arteries, a vein, and the urachus. The arteries are much ſmaller than the vein: they uſually ariſe from the iliac arteries on each ſide, ſometimes from the lower part of the aorta. They paſs on each ſide of the bladder to the navel;

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* See Ruyſch's Adverſ. Anat. T. 3. Decad. 3.

† See Ruyſch's Theſ. Anat. 5. T. 1.

§ See Ruyſch's Adv. p. 16. and alſo Memoirs of the Paris Academy 1714.

and hence thro' the navel-ſtring, with ſeveral ſpiral contortions, they run to the placenta, where they are divided and ſubdivided into a multitude of ramifications; and, finally, terminate and bring the blood from the fœtus back to the placenta; and thence, probably, it paſſes back to the mother again *.

It may be aſked, however, why the arteries are two, and why not one only, as the vein: perhaps this is the care of nature, to prevent a mortal hæmorrhage, if the navel-ſtring ſhould be hurt in the delivery, or elſe not ſufficiently ſecured by the tying afterwards.

The vein of the funiculus, tho' but ſingle, is twice as large as the arteries. It has its origin in the placenta, from almoſt innumerable ramifications, uniting into one common trunk: from thence it continues to paſs between the arteries, and with the ſame contortions that they have thro' the funiculus umbilicalis; and thence thro' the navel to the liver of the fœtus, where it terminates in a ſinus of the vena portæ, into which it diſcharges the blood and the nutritious juices which it had taken up in the placenta: from hence, thro' a ſingular canal, called canalis venoſus †, which is of a cylindrick figure, and almoſt oppoſite to the navel, the greateſt part of the blood paſſes from this ſinus of the porta immediately to the vena cava, and ſo to the heart: the remainder is diſtributed, by the branches of the porta, thro' the liver.

The urachus in quadrupeds, in general, is a canal of a pyramidal figure, extended immediately from the fundus of the bladder to the navel; and, after paſſing thro' this, it is by de-

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* See note 35.

† See tab. 3. fig. 2.

grees enlarged, and makes its way into the allantois at right angles each way, or nearly ſo *, and conveys the urine from the bladder into the cavity of this membrane †.

In the human fœtus the whole urachus is not pervious, or, at the utmoſt, it is very rarely ſo: it is uſually found ſolid, and in form of a ligament. It ſcarce appears probable, therefore, that it ſerves the office of diſcharging the urine from the bladder, in this as in the former caſe; and eſpecially as there is no ſuch membrane as the allantois in the human body, nor any cavity formed for the reception of ſo great a quantity of a fluid.

244. What is generally called the funiculus umbilicalis, is a part belonging to the fœtus, long and contorted, or twiſted in the manner of a cord. It is of the thickneſs of a man's finger, or more; and is, as before obſerved, compoſed of two arteries, and a vein called the umbilical veſſel, and ſurrounded with a common membrane, which is thick, but ſoft and ſpongeous; and is full of cells, filled with a glutinous humour, and is continuous with the amnios.

The origin of the navel-ſtring is in the placenta, from a multitude of ramifications of veins and arteries. Its termination is in the navel of the fœtus. Its length is two, three, or four ſpans, whence the fœtus has room to turn itſelf freely about in the womb, without danger of forcing the placenta from it: and a ſecond good effect of it is, that on the delivery, if the ſtring be not immediately tied up, a mortal hæmorrhage is not a neceſſary conſequence.

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* See Fabricius ab Aquapendente de fœtu formato.
† See Ephemerides, N. C. Cent. 6. Obſ. 24.
‡ See the ſame Ephemerides, Cent. 3, and 4. Obſ. 194.
§ See Rohault's Diſſertation in the Paris Memoirs 1714.

The uſe of the navel-ſtring has been already explained in that of the umbilical veſſels; but its uſe, as a compound body, is for ſecurity, that the veſſels, ſo eſſential to the life of a fœtus, may not be liable to being broken by its motions, as they would have been, if they had made their way out ſingly; and its ſtrength, in this conjunct ſtate, makes it alſo of great uſe in the drawing out the placenta, after the delivery of the fœtus.

245. After this conſideration of the parts, we are to enquire, as far as we are able, into the manner of nutrition of the fœtus, while in the uterus.

Of the nutrition of the fœtus.

This is probably effected during the firſt months, while the organs of concoction are not yet formed, ſolely by means of the navel-ſtring. But in the more advanced ſtate of the fœtus, in the latter months, there are many reaſons for ſuppoſing that it is alſo nouriſhed by the mouth, by means of a ſoft and ſomewhat glutinous fluid which ſurrounds it, and which is probably ſecreted from the amnios. In ſupport of this opinion, we are to obſerve, 1ſt, That a fluid, ſimilar to that of the amnios, is found in the mouth, the œſophagus, and the ſtomach, not only of the human fœtus, but in that of quadrupeds. 2. That this fluid is found alſo in the ſmall guts of the fœtus, but altered and digeſted. 3. That there are found alſo in the larger inteſtines real fæces, called meconium: ſometimes the whole ileum is full of theſe. 4. That in the firſt months there is a great quantity of this fluid ſurrounding the fœtus, but in the latter months there is but very little of it; and the conſumption of it is not eaſily accounted for, any other way than by its being ſwallowed by the fœtus. 5. That the liquid itſelf is ſo extremely proper for the nutrition of the

fœtus,

fœtus, that a more fit one could not have been formed or deſired. 6. That it ſeems to be continually preſſed into the mouth, œſophagus, and ſtomach of the fœtus, by the perpetual renitency of the uterus itſelf, and by the preſſure of the muſcles of the abdomen, and of the ambient air. See note 37.

Finally, another uſe of it ſeems to be, that the œſophagus, the inteſtines, the lacteals, and the thoracic duct, may be the better dilated and kept open by it, and by degrees accuſtom themſelves to the offices they are afterwards to ſerve to.

246. We are next to enquire into the ſituation of the fœtus in the womb. This in the firſt months, and even in the middle ones, is perfectly uncertain; but in the latter months it is more regular: in theſe it is uſually in a poſture like that of ſitting, and its head and neck are bent downwards; its knees are raiſed up toward its cheeks, and its heels drawn back to its buttocks. Its hands are uſually hanging down, and embrace the feet *. A little time before the delivery it uſually changes its poſition, in ſuch a manner, that its head falls toward the mouth of the womb, and its buttocks and feet are turned upwards. Frequently, however, it varies during the whole time of the pregnancy from the common rule; and at the very inſtant of the delivery, its head does not preſent itſelf; but is turned to one ſide, or to ſome other part of the womb.

Delivery.

247. Delivery, partus, is the natural excluſion of the perfect fœtus from the uterus, thro' the vagina,

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* In the year 1722, a body was opened in the ſeventh month of pregnancy. The woman had been ſhot: the head of the fœtus was in this ſubject turned to the os uteri, and the nates and feet upward.

vagina, after the rupture of the membranes it was involved in.

The cauſes aſcribed to the bringing on this excluſion of the fœtus, are, 1. That the uterus, being ſo far diſtended, can ſuffer no more dilatation. 2. That the meconium and urine of the fœtus ſtimulate ſo as to excite it. 3. That there is at that time a neceſſity of air and reſpiration: but this is all dubious and uncertain.

The ordinary and regular time of partuition is after nine ſolar months; that is, ten lunar months, or forty weeks. The premature times of delivery are at the end of the ſeventh or eighth month: the child may live, however, that is born at either of theſe periods. The earlier excluſion of the fœtus is called abortion: this may happen at any time before the ſeventh month; and at whatever time it happens, the fœtus cannot live.

The ordinary or natural manner of delivery is, when the fœtus aſſiſts its own excluſion, with its head preſſing full againſt the mouth of the womb. When the mouth of the womb naturally opens, the membranes burſt, which had before wrapped up the fœtus, and the liquor they contained is excluded; and the fœtus is finally expelled by the joint contractions of the uterus itſelf, of the muſcles of the abdomen, and of the diaphragm.

All other ſituations of the fœtus, at the time of delivery, are termed unnatural; and they always cauſe difficulty in the delivery, ſometimes an utter impoſſibility of it, unleſs the aſſiſtance of art be called in.

Thoſe deliveries in which the child preſents its buttocks, or its feet, are the neareſt to the natural and proper one; and conſequently the child may be thus born either entirely without the help of art, or with but a very little aſſiſtance from it.

248. We are, finally, in our examinations into the nature of the human fœtus, to enquire into the more eſſential differences between that and an adult; conſidering the fœtus not only as yet incloſed within the womb, but as newly come from it.

In the abdomen, the umbilical vein, and arteries of the navel, and the canalis venoſus in the liver, are, in the fœtus, open and pervious; in adults, they are contracted and ſolid.

The liver is very large; the ſtomach is filled with a glutinous fluid; and the larger inteſtines, and often the ileum alſo, with the fæces called meconium.

The vermiform proceſs of the inteſtinum cœcum, is larger than in adults; and is alſo full of the meconium.

The renes ſuccenturiati are larger in the fœtus than in adults.

The kidneys themſelves are not ſmooth and even on the ſurface, as in adults; but unequal, and in ſome meaſure reſemble thoſe of a calf.

The urinary bladder is of a longer ſhape, and extends almoſt to the navel.

The hymen in a female fœtus is very plain and obvious.

In the thorax, beſide a peculiar fluid, found as well in this cavity as in the abdomen,

The gland thymus is larger than it is in adults.

The lungs, as they have never yet been inflated by breathing, are collapſed, and of a blackiſh colour: and if thrown into water, they ſink in it, contrary to what is the caſe in thoſe of adults.

In the heart, the foramen ovale between the left and right auricle, and the canalis arterioſus, between the pulmonary artery and the aorta, are open, to ſerve for a peculiar circulation in the fœtus, which has not yet breathed; and there is in the inferior trunk of the vena cava, near the heart, a remarkable valve *.

In the head, beſide its great ſize, in proportion to the body, we are to obſerve, that the oſſa cranii are in ſeveral places diſtant from one another, eſpecially at the fontanella, and that the ſutures are wanting. The brain alſo is ſofter than in adults.

The teeth are alſo imperfect, and not rooted in the gums: they lie hid or buried under the gums, to appear at a more advanced period.

The meatus auditorius is not yet perfect in them; and in the fœtus, whilſt it is in the womb, is entirely cloſed up by a peculiar membrane, which is continuous with the epidermis, and which naturally diſappears after delivery †.

The bones of the whole body, excepting only a very few, are either ſoft, or yet abſolutely imperfect: ſome of them are merely cartilaginous; and the articulations are not at that time perfected.

CHAP. VI.

The contents of the Thorax, the other part of the trunk of the human body.

249. THE thorax is that large part of the body ſituated between the abdomen and the neck: it is alſo called pectus.

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* Winſlow has deſcribed this in the memoirs of the French Academy 1717; and Cheſelden in his Anatomy, Ed. 1. T. 9. fig. 1. calls it valvula nobilis; but in the third edition he has omitted the plate and the deſcription of it.

† See Kerkring's Oſteogenia, p. 222. See alſo Ruyſch.

Its parts are of two kinds, the continent or containing, and the contained.

The continent parts, or thoſe which form the cavity, are either common or proper. The common continent parts of the thorax are, the cuticula, the cutis, and pinguedo. Theſe have been conſidered already in ſections 197, 198, and 201.

The continent parts, proper or peculiar to the thorax, are theſe: the breaſts, the pectoral muſcles, the intercoſtals, the diaphragm, the pleura, and, finally, the bones. Of theſe there are twenty-four ribs, the ſternum, and twelve vertebræ: theſe have alſo all been deſcribed already in their place in the Oſteology.

The contents of the cavity formed by theſe, or the parts contained in the thorax, are the mediaſtinum, the lungs, the heart and its pericardium, with the large veſſels ariſing from it, particularly the trunks of the aorta and pulmonary artery, of the vena cava and pulmonary vein, the thoracic duct, and, finally, the greater part of the œſophagus.

The uſes of the parts of the thorax in general, are their ſerving to reſpiration, and the circulation of the blood in both ſexes; and in women to the producing milk.

The breaſts.

250. The breaſts, mammæ, occur firſt in our examination of this part of the trunk. In men they are ſmaller, and ſerve to no purpoſe but ornament. In women they are of the utmoſt importance; and 'tis, therefore, in the female only the anatomiſt is to employ his reſearches.

In the human ſpecies they are, for many great and obvious reaſons, ſeated on the breaſt; in animals of all other kinds, they are ſituated on the abdomen.

In the human ſpecies they are only two in number; in quadrupeds of different kinds, they are very various in number and ſtructure.

In order to their being ornamental, it is requiſite that they be of a moderate ſize, and ſtand at a conſiderable diſtance; that their ſkin be white and ſoft, their ſubſtance firm, not flaccid or pendulous, and the nipple red.

Their ſize is very various and uncertain. In virgins they are uſually ſmall: in women who are with child, or who have given ſuck, they are larger, often very enormous. In very young and very old perſons, they are always ſmall; and they differ in bigneſs alſo in the ſeveral different countries.

The time of the breaſts growing full in women, is about the age of fourteen. The time of their decreaſing again is various: about the fiftieth year is the moſt frequent and moſt natural time; but it happens ſometimes later, ſometimes ſooner.

The nipple of the human breaſt is a little eminence, nearly of a cylindrick figure, red in colour, and placed in the middle of the breaſt, and ſurrounded with a circle.

Its ſubſtance is cavernous, almoſt like that of the human penis; and hence it is capable of being rendered erect and tumid on titillation, and in ſuckling. It is compoſed of a multitude of fine nervous fibres, diſpoſed in a reticulated manner, and is therefore of an extremely quick ſenſe; and is furniſhed with a great number of blood-veſſels from the mammary ones. The extremities of the lacteals alſo are abundant in it, and the epidermis ſurrounds every part of it. The foraminula, or orifices of the lacteal tubes, are very conſpicuous in women who give ſuck, on their preſſing their breaſts, and forcing out the milk: they are in number from ſeven to ten.

The circle which ſurrounds the nipple is beſet with ſmall glands [*]. In virgins it is uſually of a fine bright red colour: in women a little more advanced it is of a duſkyer red, or ſometimes browniſh; and in old women it is livid and dull.

The uſe of the nipple is for the giving ſuck to the infant, who, without it, could ſcarce poſſibly get at it.

The breaſts, beſide the common integuments of the body, that is, the epidermis, the cutis, and fat, are compoſed of a ſingular glandulous matter, of a whitiſh colour, not unlike that of the ſubſtance of the udder in quadrupeds. This forms the inner or central part, to the midſt of which the nipple anſwers; and is ſurrounded by a larger or ſmaller quantity of fat, which makes by much the greater part of the breaſt [†]. Nuck [‡], Verheyen [||], and their followers, have deſcribed what they call globoſe bodies, corpora globoſa, as diſtinct glands; but there are by no means glands, but merely fat, as Morgagni has ſince abundantly proved [§].

Among the glandulous ſubſtance, however, of which the breaſts are compoſed, there are arranged, beſide the blood-veſſels, a multitude of lactiferous tubucles or ducts, which unite by frequent anaſtomoſes: theſe are large in women who give ſuck, and are dilated into ſinus's in many places, forming a kind of cells, which hold the ſecreted milk, and communicate with the veins and arteries. All theſe parts are to be ſeen much more diſtinctly in breaſts that are large, and full of milk, than in others: they are, indeed, ſcarce to be diſtinguiſhed at all in young women, in ſuch as have little breaſts, in ſuch as are emaciated, or in thoſe of very old people.

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[*] As to the nature of theſe, ſee Morgag. Adverſ. 1. S. 12. and 4. p. 8.

[†] See Morgag. Adverſ. 4. fig. 3.

[‡] Adenographia, fig. 2.

[||] Anat. Corp. human. T. 18. fig. 2, and 4.

[§] Adverſar. 2. 92.

The arteries and veins of the breaſts are called mammary veſſels, and are ſent from the ſubclavian and axillary veſſels. The former of theſe are called the internal, and the other the external ones. The nerves are from the dorſal ones of the ſpinal marrow; and to theſe Wharton * adds lymphaticks.

The uſe of the breaſts are, 1. To ſecrete in their glandulous ſubſtance the milk from the arterial blood, to collect it in the ſinus's and tubuli lactiferi, there to preſerve and retain it, and, at a proper time, to afford it to the infant thro' the nipple. 2. To add to the peculiar beauty of the female. 3. To add a ſtimulus to venery, on both parts, while they are handled and preſſed.

251. When the breaſts are removed, there occur certain muſcles and the pleura. The muſcles are, 1. Two called the pectoral muſcles: theſe are large: there is one of them on each ſide, extending from under the breaſt to the arm. 2. The intercoſtal muſcles, no fewer in number than twenty-two external ones, and as many internal: theſe are placed between the ribs, and ſerve to elevate them, and to aſſiſt in reſpiration; but of theſe we ſhall ſpeak more largely in the Myology, 3. The membrane called pleura, is alſo to be hereafter treated of ſingly, and at large: this membrane ſurrounds the whole cavity of the thorax.

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* Adenograph. cap. 36.

252. When we have obſerved theſe, the breaſt is to be opened; and in this are to be obſerved the cartilaginous parts of the ribs: thro' theſe, near the bony part, the inciſion is to be made on each ſide, and the ſternum is to be elevated. As ſoon as this is done, there occurs firſt the mediaſtinum.

253. The mediaſtinum is a double membrane, continuous to the ſternum, ſituated under it, and adhering firmly to it. It divides the cavity of the thorax longitudinally into two parts. In this we are to obſerve the cellulous interſtice, which is between the two membranes, and is ſufficiently obſervable in that part of the mediaſtinum which is neareſt the diaphragm: in this there are ſometimes abſceſſes and inflammations.

The mediaſtinum is connected with the ſternum pleura, pericardium, and other adjoining parts. Its ſituation is not exactly under the middle of the ſternum, but ſomewhat to the left ſide: by this means the right part of the thorax is rendered larger than the left *.

It receives veins and arteries from the mammary and diaphragmatick veſſels, and ſometimes has proper and peculiar ones of its own from the aorta and cava: theſe are then called the mediaſtinal veſſels. Its nerves are ſmall, and are from the diaphragmaticks and the par vagum. It has alſo a number of lymphaticks, which run to the ductus thoracicus.

The uſes of the mediaſtinum are two, 1. To divide the breaſt longitudinally into two parts, for ſeveral very great purpoſes; as, firſt, that on one of the lobes of the lungs being ulcerated, the

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* See Winſlow in the Memoirs of the Paris Academy 1715, p. 309.

other might not be immediately affected. 2. That water, matter, or any thing elſe contained in one part of the thorax, might not, at the ſame time, affect both parts of the lungs. 3. That in caſe of a wound in one ſide of the thorax, reſpiration might be continued in the other, and the perſon not immediately ſuffocated. The ſecond general uſe of the mediaſtinum is to ſupport the heart in its pendulous ſtate, for the benefit of its free motion, eſpecially when we lie on our backs.

254. When the mediaſtinum is diſſected, and the ſternum removed, we are to obſerve the ſituation of the ſeveral parts in the cavity of the thorax. The diaphragm is placed tranſverſely in the lower part of the cavity.

The glandulæ thymi in the upper and middle part.

The lungs on each ſide.

The heart in the middle, or nearly ſo, ſurrounded with its pericardium; but ſo placed, that its greater part is on the left ſide.

The œſophagus, or gulæ, in the hinder part, on the left ſide.

The great veſſels, as the vena cava and azygos, in the hinder part, on the right.

And, finally, the thoracick duct in man, between the aorta and the vena azygos.

255. Before we proceed to examine theſe ſingly and particularly, we are to obſerve the pleura. This is a ſmooth, robuſt, and tenſe membrane, adhering to the ribs and to the intercoſtal muſcles, and ſurrounding the whole cavity of the thorax. In this membrane we are to remark the ſtructure, which is as if it were compoſed of two ſacks, one of which ſurrounds one ſide of the thorax; the other, the other ſide; and each of them contains one of the two lobes of the Pleura.

lungs:

lungs: from the conjunction of theſe two ſucculi of the pleura, in the middle of the thorax, is formed the mediaſtinum.

The pleura is compoſed of a double membrane, of a very muſculous ſtructure. Its veſſels are arteries, veins, nerves, and lymphaticks. The arteries ariſe from the intercoſtals, the diaphragmatick and the mammary ones, and are very numerous; the veins, from the veins of the ſame names with thoſe arteries; but all of them diſcharge themſelves into the trunk of the vena azygos, and the upper trunk of the cava. The nerves are from the vertebræ of the thorax, and the diaphragmatick ones. The lymphaticks all run to the ductus thoracicus.

Many of the later anatomical writers have attributed glands alſo to the pleura; but this is without foundation.

The uſe of the pleura is to lubricate, and to ſtrengthen the whole cavity of the thorax.

Thymus. 256. The thymus is a gland, which, in infants, is very remarkable: it is ſituated in the upper part of the thorax, immediately under the ſternum, and lies upon the pericardium, and on the trunk of the aorta, and of the vena cava.

It extends itſelf from the pericardium, along the trunk of the aorta, to the beginning of the carotids; ſometimes as far as to the thyroide gland. Its figure is irregular and uncertain *. Its colour in infants is a pale red; in adults it is of a duſkyer hue. It is much larger in infants newly born, than in ſubjects at any more advanced period. Its length is there not leſs than three fingers breadth, and its diameter two: its thickneſs is about half a finger. It gradually decreaſes from

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* See tab. 4. fig. 14, and 15.

this ſize as the child grows up *. In adults it is very ſmall, and in old people it almoſt entirely diſappears.

Its ſubſtance is glandulous and conglomerate, and it is ſurrounded by a membrane. It has its blood-veſſels ſometimes from the ſubclavians, ſometimes from the mammary, and ſometimes from the mediaſtine ones; and, in ſome ſubjects, from the carotids and jugulars. Its lymphaticks ſometimes run to the thoracic duct, ſometimes to the ſubclavian veins, and they have in general no valves. The nerves of the thymus are from the par vagum, or from the intercoſtals. There is ſometimes a milky juice found in this gland in new-born ſubjects. It has no excretory duct hitherto diſcovered, and its uſe is therefore not certainly known.

Poſſibly, it ſerves to ſecrete lymph, which it diſcharges into the thoracick duct, for the dilution of the blood and of the chyle; as the glands of the meſentery and pancreas do, in regard to the chyle. On this ſuppoſition, its uſe is much greater in the fœtus than at any time after the birth, becauſe the want of reſpiration in that ſtate may well be ſuppoſed to ſubject the blood to be thicker, and to need more dilution than afterwards, nothing tending to attenuate the blood ſo much as reſpiration. Bellinger is of opinion, that it prepares a nutritious fluid for the fœtus, while in the uterus, and conveys it by particular ducts to its mouth †; but we are to obſerve, that neither himſelf, nor any body ſince, have ever been able to find out theſe ducts.

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[*] It has been found indurated by a ſchirrus, and very large, in a boy of thirteen, who died of a hectick.

[†] See his Tract. de fœtu nutritio, London 1717.

The diaphragm. 257. The diaphragm is a large, robuſt, muſculous ſkin, placed tranſverſely in the trunk, and dividing the thorax from the abdomen. The Latin writers hence call it ſeptum tranſverſum. Its ſituation is not exactly even, but ſomewhat oblique, between the abdomen and thorax; ſo that the anterior part is higher, the poſterior lower; and its upper ſuperficies is convex, its lower concave. It is connected with the ſternum, the ſpurious ribs, the pericardium, the mediaſtinum, and the vertebræ of the loins. Its figure, taken tranſverſely, is ſomewhat oblong and elliptick. See Fig. 13.

There are in the diaphragm two large foramina. The firſt is in the left ſide of it, and gives paſſage to the gula and the par vagum. The ſecond is in the right ſide of it, and the lower trunk of the vena cava paſſes thro' it. There is alſo an interſtice between the two heads of the lower part, thro' which paſs the aorta, the vena azygos, and the ductus thoracicus.

The veſſels of the diaphragm are called vaſa phrenica, from φρην, the Greek name for the diaphragm: they are arteries, veins, nerves, and lymphaticks.

The arteries are, 1ſt, from the aorta, or from the cœliac: 2dly, from the ſubclavian, or mammary: and, 3dly, from the intercoſtal and lumbar ones*.

The veins are from the cava, the azygos, and the ſubclavian.

The nerves are, 1ſt, two great ones, called diaphragmaticks, ariſing from the vertebral ones of the neck on each ſide, and almoſt totally inſerted

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* See Ruyſch, Epiſt. 9. p. 13.

ſerted in it *: 2dly, ſome branches from the intercoſtals and par vagum. The lymphaticks go to the jugular vein †.

The diaphragm is covered with a membrane, on the upper part from the pleura, on the lower from the peritonæum. Its ſubſtance is muſcular. Its upper part, which is large and elliptick, ariſes from the ſpurious ribs, the tranſverſe muſcles of the abdomen, and the cartilago xiphoides; and, with its tendon, renders the nervous centre of the diaphragm almoſt triangular. The lower ariſes from a double baſe, from the vertebræ of the loins on each ſide, and is inſerted nearly into the centre of the ſuperior ‡.

The uſes of the diaphragm are, 1ſt, to aſſiſt in reſpiration; for, in taking in the breath, it is preſſed downwards, and, in expiration, it riſes upward into the cavity of the thorax. 2. To aſſiſt the neceſſary motions of the contents of the abdomen, viz. of the ſtomach, inteſtines, liver, and ſpleen; and in the promoting the ſecretions of chyle, bile, &c. And, laſtly, for aſſiſting in the expulſion of the fæces, the urine, the fœtus in parturition, and the ſecundines.

258. The lungs are the largeſt viſcus of the thorax. They are ſituated in the two ſides of the thorax, having the heart, as it were, in the midſt of them. They are connected, by means of the mediaſtinum, with the ſternum and vertebræ; with the heart, by means of the pulmonary veſſels, and immediately with the aſpera arteria. The colour of the lungs, in infants, is a fine florid The lungs.

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* The left of theſe is longer than the right. See Winſlow in the Paris Memoirs, 1715.

† See Nuck's Adenographia, p. 142.

‡ Cowper has given elegant figures of the diaphragm, T. 34 and 35, of his Myot. nov.

red; in adults, it is darker; and, in old people, livid, or variegated with black and white. In figure, when inflated, they ſomewhat reſemble the hoof of an ox; and are convex on the upper ſide, and concave underneath.

They are divided into two large lobes, the right and left; the left lobe, which is the ſmaller, is divided again into two; and the right, which is larger, into three ſmaller ones; and theſe into innumerable other ſtill leſſer. The membrane, with which the lungs are ſurrounded, is continuous with the pleura. Their ſubſtance is ſpongeous, or veſiculous. They ſeem, indeed, intirely compoſed of a number of ſmall veſicles, of a fleſhy texture, and of a variety of veſſels.

The bronchia are, in their origin, formed of imperfect annuli, or rings; and, in their progreſs, of cartilaginous and membranous fruſtæ, very variouſly connected and joined together. Theſe have their origin from the trachea, and are firſt divided into branches, afterwards ſubdivided again, and into almoſt innumerable ramifications: they finally terminate in thoſe ſmall veſicles, which form the greater part of the ſubſtance of the lungs. Theſe veſicles have interſtices all the way between them, and adhere, as it were, to the branches of the bronchia, in the manner of cluſters of grapes.

The pulmonary artery and vein are divided in the ſame manner as the bronchia, and accompany them all their length, tho' in a various manner in the various parts; and, finally, extending their ultimate ramifications about the veſicles, they form what is called the rete vaſculoſum of Malpighi: they do not ſerve, however, as ſome have ſuppoſed,

poſed, merely for the nutrition of the parts; but for the circulation of the blood thro' the lungs.

The veſſel called the bronchial artery of Ruyſch, is allotted to the nutrition of the lungs: it riſes ſometimes ſingle, ſometimes double, ſometimes triple from the aorta and intercoſtals, and adheres every where firmly to the bronchia *.

The bronchial vein is either from the intercoſtals, or from the vena azygos.

The nerves ariſe from the thoracick plexus of the par vagum and the intercoſtals.

The lymphaticks run to the thoracick duct.

The uſes of the lungs are, 1ſt, for the office of reſpiration, by which the blood is attenuated in the plexus of arteries, called the rete vaſculoſum. 2. To be aſſiſtant to the voice in ſpeaking, and to the ſenſe of ſmelling. They are alſo emunctories of the blood, and are of many other important ſervices.

Aſpera arteria.

259. The aſpera arteria, called alſo the trachea, and fiſtula ſpiralis, and in Engliſh the windpipe, is a tube or canal, extended from the mouth down to the lungs. Its ſituation is in the middle and anterior part of the neck; and it is connected with the fauces, the lungs, and the œſophagus. Anatomiſts divide it into two parts; 1ſt, the larynx; and, 2dly, the aſpera arteria, ſtrictly and properly ſo called.

The larynx is the thick upper part, or head of the tube juſt mentioned. In this there is an aperture to the lungs, called the glottis: this is of an elliptick figure, and is furniſhed with cartilages and muſcles †; by means of which it is occaſionally dilated or ſtraitened, ſo as to give the wonder-

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* See Ruyſch valvular. lymphat. dilucid. p. 61. Epiſt. 6.

† Concerning theſe, ſee the Myology, S. 324.

wonderful variety of notes the voice is capable of, in ſpeaking and ſinging *.

The larynx is principally compoſed of five cartilages. The firſt is the thyroide, or ſcutiform cartilage: it is of a kind of quadrangular figure, and ſtands in the anterior part, where the pomum adami, as it is uſually called, makes its prominence, and is the largeſt of the five. The ſecond is the cricoide, or annular one: this occupies the loweſt part, by way of baſe to the reſt: to the lower part of this, what is properly called the aſpera arteria adheres. The third and fourth are the two arytænoide ones †: theſe form, as it were, a kind of baſon of a ſingular figure, which is joined to the poſterior and ſuperior parts of the cricoides, by peculiar articulations on each ſide, that the glottis may be the more readily opened and contracted §. The fifth is the epiglottis: this is often of the ſhape of a leaf of ivy, and is joined to the ſuperior and anterior part of the thyroides, over which it appears erect, immediately behind the root of the tongue; to which it is alſo connected by its middle ligament, by two lateral ones to the cornua of the os hyoides, and by two poſterior ones to the arytænoide cartilages: this, in the act of deglutition, covers the glottis, in the manner of a moveable bridge, to prevent any thing falling on it.

The membrane which inveſts the larynx is very ſenſible, and is furniſhed with a number of oſcula or openings, which diſcharge a lubricating fluid. There are alſo glands, called glandulæ arytænoideæ,

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* See Dodart in the Memoirs of the French Acad. 1700.

† Santorini will have each to conſiſt of a double one; ſo number ſeven, p. 97.

§ Theſe four firſt cartilages often oſſify, as has been already obſerved.

deæ, and glandulæ epiglottidis, extended over each ſurface of it, which ſerve for ſecreting a mucous fluid, for lubricating the whole aſpera arteria.

The ventricles, or ſinus's of the larynx, are certain hollows, ſome of them ſmaller, ſome larger, on the inſide of it, under the glottis, ſerving for the modulations of the voice *.

The aſpera arteria, or trachea, properly ſo called, is the remaining part of that cartilaginous canal before deſcribed, which is extended from the larynx to the bronchia; and is, in ſome meaſure, of a conic figure.

The beginning of this is round, and is ſo large, that it eaſily admits of a finger: its end is ſomewhat narrower. It enters the cavity of the thorax, under the ſternum; and there, before it joins the lungs, is divided into two branches, a right and a left, called bronchia; which are afterwards ſubdivided and diſtributed thro' the lungs in very minute portions, 'till by degrees they terminate in the veſicles which compoſe their ſubſtance.

It is compoſed of eighteen or nineteen, ſometimes but ſixteen, ſometimes twenty cartilaginous rings or annuli, and four coats.

The annuli, or rings, are imperfect; for the whole trachea on its hinder part, as alſo the beginning of the bronchiæ, are membranaceous: this is contrived by nature, partly, that they may not be troubleſome to us in ſwallowing; partly, that they may be ſubject to dilatation and contraction, to aſſiſt in the modulations of the voice, and in the expulſion of the excrementitious matter, which nature has deſtined the body to be ridded of that way.

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* Of the whole ſtructure of the aſpera arteria, ſee Morgagni Adv. 1. T. 1, and 2.

Of the four tunics, or coats, the exterior is membranaceous; the ſecond is glandulous*, the third is muſcular, and the ſeveral rings are joined together by this, which is formed of tranſverſe fibres, running from the ſeveral extremities of one to the other, ſo as to have a power of contracting them †. The fourth or internal covering is tendinous and robuſt: this alſo, by means of its longitudinal fibres, has a power of rendering the trachea and bronchia ſhorter, and there are ſeveral oſcula of glands and ſecondary tunics ſeen in it §.

The arteries of the aſpera arteria are from the external carotids; the veins from the jugulars: the nerves are from the recurrent ones of the plexus cervicalis.

The uſes of the trachea are, to aſſiſt in deglutition, and to be aſſiſtant to the lungs.

On the exterior part of the aſpera arteria, there are certain glands very obſervable: they ſerve for the moiſtening it. They are the thyroide and bronchial.

The thyroide gland is of a very ſingular figure, reſembling that of a new moon. It adheres by its middle part to the upper ring of the trachea, and its points or horns are turned upwards. It adheres on each part to the larynx and œſophagus. But of this we ſhall have occaſion to treat more largely S. 383.

The bronchial glands are of various ſizes, ſome larger, ſome ſmaller. They are of a blackiſh colour, and are connected to the lower part of the trachea, to the diviſions of the bronchia, and to the œſophagus. Their uſe is uncertain; but we ſhall have occaſion to ſpeak more of them S. 388.

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* See Morgagn. Adv. 1. T. 2. fig. 1. oo.

† See the ſame, letter P.

§ See the ſame, table 1.

260. After the lungs we are to examine the heart. The heart.

The pericardium is a membranaceous bag, looſely including the heart, and ſituated in the middle and lower part of the thorax, between the two lobes of the lungs. The figure of the pericardium is conic, like that of the heart itſelf. Its ſize is ſuch as can conveniently contain the heart, without preſſing upon it. It is connected with the mediaſtinum, with a great part of the diaphragm, and with the large veſſels of the heart, which, together with this covering, ſuſtain alſo the heart itſelf in its place. In beaſts of moſt kinds, the heart is not at all connected with the diaphragm by its pericardium.

The pericardium is compoſed of a double membrane: the exterior one is common with the pleura and mediaſtinum: the interior one is proper, lubricous, and is continuous with the coats of the larger veſſels. This membrane, when expanded upon the finger, frequently diſcovers a great number of foraminula, or little apertures. The arteries and veins of the pericardium are from thoſe of the mediaſtinum and diaphragm; and its nerves alſo are from the diaphragmaticks. Its lymphaticks all run to the thoracic duct.

The uſes of the pericardium are, 1ſt, to ſupport the heart in a pendulous ſtate, eſpecially when we lie down. 2. To defend the heart from the cold air taken into the lungs. 3. To preſerve it from being injured by water, by matter, or any other extraneous fluid in the cavity of the thorax. And, 4. To contain the liquor of the pericardium, as it is called, which ſerves to facilitate the motions of the heart.

The liquor of the pericardium is a fluid, reſembling, in appearance, water in which raw fleſh had been waſhed. This is found in a ſmall quantity in the pericardium, and ſeems deſtined for the keeping the ſurface of the heart moiſtened, for the rendering its motions, which muſt neceſſarily be continual and eaſy, the more free: much of a fluid is not required to this purpoſe, but that there ſhould be ſome is neceſſary; and this bag is deſtined by nature, among other of its uſes, for the retaining of it. The anatomical writers in general, deduce this fluid from certain glands, ſituated either in the pericardium, or in the heart itſelf: but as theſe glands are not to be found, it appears more rational to ſuppoſe, that it is expreſſed out from the auricles of the heart in its ſyſtole, whence there is neceſſarily a conſtant ſupply, tho' no redundance of it. The obſervations made by Bartholine on the caſe of a wound in the pericardium *, and the experiments of Thebeſius †, tend to confirm this: and, in fine, it ſeems probable, that it is, when redundant, abſorbed by the pores of the pericardium, rather than excreted; tho' many are againſt this ‡.

The pericardium is found ſometimes, in long hecticks, to cohere with the ſubſtance of the heart; and there are accounts of its having been wholly wanting ‖.

261. The heart itſelf is a muſcular part, included in the pericardium, and ſituated nearly in the middle of the breaſt, between the lobes of the lungs. It is the primary organ of the circulation of the blood, and conſequently of life.

Its figure is nearly conic: its larger part is called its baſe; its ſmaller, the apex: its lower

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* See his Anat. Reformat. cap. de Pericardio.

† Diſſertat. de Circulat. Sang. in Corde.

‡ See Littre's Experiments in the Paris Memoirs 1711.

‖ See the ſame, 1712.

part is plane; its upper, convex. Its ſituation is nearly tranſverſe, or horizontal; ſo that its baſe is in the right, and its apex, with the greateſt part of its bulk, is in the left ſide of the thorax; and, conſequently, it is there that the pulſation of it is felt *.

The plane ſurface of the heart lies on the diaphragm; the convex one is turned upwards. The heart is connected, 1ſt, by the intervention of the pericardium with the mediaſtinum, and with a large part of the middle of the diaphragm: this is contrived by nature, to prevent its being diſplaced, inverted, or turned too rudely about, in conſequence of the various motions of the body. 2. Its baſe is connected to its common veſſels; but its apex is free, and is received into a kind of cavity in the left lobe of the lungs.

The length of the human heart is about ſix fingers breadth: its breadth, at the baſe, is about five fingers; and its circumference about thirteen. Its ſubſtance is muſcular, and it has two large cavities called ventricles; and is ſurrounded, both externally and internally, with a ſmooth membrane. There is a quantity of fat about the heart, which covers its baſe and its apex, and ſerves for lubricating it, and for facilitating its motions. Its blood-veſſels are of two kinds, common and proper. The proper or peculiar veſſels of the heart, are the coronary arteries and veins, which are beautifully and elegantly diſtributed through the heart, and are finely delineated by Ruyſch †.

The common veſſels of the heart are two veins, called the vena cava, and the vena pulmonalis; and two arteries, the arteria pulmonalis, and the aorta.

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* See its ſituation finely expreſſed in Euſtachius, T.9.

† See Epiſt. Prob. 3. and Theſ. Anat. 4. T. 3.

The nerves of the heart are not large; they ariſe from the par vagum and the intercoſtals.

The auricles of the heart are two: they are a kind of appendages of the heart at its baſe, and are diſtinguiſhed by the names of the right and left. The right auricle is much larger than the left; and this is placed in the hinder, that in the anterior part. They are intended as diverticula for the blood, during the time of the ſyſtole. Their ſubſtance is muſcular, and compoſed of ſtrong fibres, running into a kind of columns, as it were, with furrows between them for their conſtriction, and the expulſion of the blood out of them into the heart, when it is in its diaſtole: their motion therefore is not ſynchronous with that of the heart, but achronous.

There are alſo two cavities in the heart, called its ventricles: of theſe the right is thinner and weaker in its circumference, but uſually much more capacious than the left. They receive the blood from the vena cava, and from the right auricle, and deliver it into the pulmonary artery, to be carried to the lungs. The left ventricle is much thicker and ſtronger in its ſides; but it is narrower and ſmaller than the right: it receives the blood from the pulmonary vein and the left auricle, and extrudes it very forcibly into the aorta. The right ventricle is in the anterior part of the thorax; the left in the hinder part: ſo that they might be called the anterior and poſterior ventricles, much more properly than as they are the right and left.

Between the two ventricles of the heart there is a very robuſt and ſtrong ſeptum, which is not perforated. In the right auricle there is alſo a large tubercle in the hearts of quadrupeds, ſituated between the meeting of the upper and lower cava. Lower, and his followers, give great uſes to this in the human fabrick; but they ſhould have known, that it is not found in the human heart at all.

There are, in the ſides of both the ventricles of the heart, and of both its auricles, ſeveral columnæ carneæ, or lacertuli, with furrows between them, ſeeming ſo many ſmall and diſtinct muſcles; and from the concourſe of the tendinous fibres of theſe in the heart, there are formed peculiar membranes, or valvulæ, which are ſituated at the orifices of the auricles of the heart: and there are alſo other columns of this kind, which run from one ſide of the ventricles, tranſverſely, to the other: theſe ſerve partly to aſſiſt the contraction of the heart in its ſyſtole, and partly to prevent its too great dilatation in the diaſtole *.

The valvulæ of the heart are of three kinds, 1. The tricuſpidales: theſe are three in number, and are ſituated at the ingreſs of the vena cava in the right ventricle. 2. The mitrales: theſe are two, and are ſituated in the left ventricle at the ingreſs of the pulmonary vein: theſe ſerve to hinder the ingreſs of the blood from the heart into the veins again, while they are conſtricted. 3. The ſemilunar ones: theſe are three, and are ſituated at the origin of the aorta and pulmonary artery, and ſerve to prevent the reflux of the blood from them into the heart: theſe, for the ſake of ſtrength, are furniſhed with a number of fleſhy fibres and ſpheroide corpuſcles †.

The orifices of the veins of Thebeſius ‡ and Verheyen §, in the hollows of the heart, have

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* See Cowper's Myotom. nov. T. 36. ad 40.

† See Morgagni Adverſ. 1. T. 4. fig. 3.

‡ Diſſert. de Circul. Sang. in Corde.

§ Anatom. cap. de Corde.

been very improperly taken, by Vieuſſens * and others, for arteries, excreting the ferment, as they have expreſſed it, of the heart. Their office is truly to carry back the blood from the ſubſtance of the heart to its cavities.

The fibres of the heart are of a muſcular ſubſtance, and of a moſt amazing fabrick. They were firſt explained by Lower †, in a very elegant manner. They are of two kinds: 1. Strait ones in the left ventricle: and, 2d, ſpiral ones, common to both ventricles, and of two orders. The exterior ones run to the left, from the baſe of the heart: the interior ones run to the right, and interſect the others; and, when they act, they cloſely conſtringe the cavities of the heart, and drive out the blood from them.

According to this fabrick, the heart may be reſolved into two muſcles, each of which conſtitutes one of its ventricles §.

The uſe of the heart, in the œconomy, is for the circulation of the blood. It receives the blood from the veins, running from all parts of the body; and propels it again, by its own motion, to all thoſe parts, thro' the arteries. On this depend life itſelf, the preſervation of the frame, and the motions and actions of all its parts.

This motion of the heart is wonderful: it continues to the utmoſt period of life, day and night, without a ſingle moment's interruption or intermiſſion; and is performed more than an hundred thouſand times every day. Here is, indeed, ſomething like what the mechaniſts want under the name of a perpetual motion; and the ſtupendous

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* Nouvelles decouvert de la Cœur.

† Tract. de Corde.

§ Winſlow in the Paris Memoirs, 1711.

wiſdom of the Creator is in nothing expreſſed more gloriouſly *.

The circulation of the blood in the fœtus, while yet incloſed in the womb, as there is a defect of reſpiration, and the lungs are intirely at reſt, is performed neceſſarily in a very different manner from that in adults, in whom reſpiration has ſo great a ſhare in it. The blood in the fœtus is not (except a very ſmall quantity) propelled thro' the lungs; but is partly ſent thro' the foramen ovale, which is between the right and left auricle, and partly thro' the canalis arterioſus, which is between the aorta and the pulmonary artery, to the left ventricle of the heart and the aorta.

262. The œſophagus, or gula, called by ſome of the antients the ſtomachus, is a membranaceous canal, reaching from the fauces to the ſtomach, and conveying into it the food and drink taken in at the mouth. Its figure is ſomewhat like that of a funnel; and its upper part is called by anatomiſts the pharynx. Its ſituation is almoſt exactly behind the aſpera arteria, and longitudinally with the vertebra of the neck and back; but when it enters the cavity of the thorax, it turns a little to the right, on account of the aorta.

Its ſubſtance is membranaceous; and it is compoſed of five coats: the firſt or exterior coat is membranaceous, and is continuous with the pleura in the thorax. The ſecond is robuſt and muſcular; and, in the human body, it is compoſed of a double ſtratum of fibres: thoſe of one ſeries, longitudinal; thoſe of the other, annular or cir-

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* See Hamberger's Diſſertat. de Deo in Demonſtratione Cordis.

cular *. In oxen it is compoſed of two ſpiral lamellæ, decuſſating with one another, and ſerving very advantageouſly for the conſtriction of the part. The third coat is cellular, much like that of the inteſtines. The fourth is nervous, and is diviſible into a number of other lamellæ, and furniſhed with a multitude of glands and veſſels: this is hence divided by Verheyen † into two, under the names of a vaſculous and a glandulous coat. This is continuous with the interior membrane of the mouth and ſtomach. The fifth coat is villoſe, and is called by authors cruſta villoſa: this is always covered with a mucous liquor.

The muſcles of the pharynx ſerve to open or ſhut the œſophagus: but of theſe we ſhall treat more at large in the Myology.

There are a number of glands ſituated in the upper part of the pharynx; and excretory oſcula, or openings, are frequently diſcovered with them.

The arteries of the œſophagus are from the carotids, the aorta, the intercoſtals, and the cœliac.

The veins are from the jugulars, the azygos, and the coronary vein of the ſtomach.

The nerves are from the par vagum. That there are alſo lymphaticks, is probable; but they are, at leaſt, not eaſily diſcovered.

There are alſo certain excretory ducts, called ductus excretorii novæ Vercelloni §, which ariſe from the glands, and convey a ſaltiſh liquor into the œſophagus and ſtomach. The glands, from which theſe have their origin, are of three kinds:

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* See Cowper's Myotom. in fol. T. 29. fig. 3; Schelhammer's Analect. diſſ. 8. 54; and Santorini, p. 138. who contended for their being ſquare.

† See Anatom. de Oeſophagus.

§ See Diſſect. Anat. de Gland. Oeſophag.

1. The gaſtrick glands, which are conglomerate, and are ſituated near the left orifice of the ſtomach. 2. The dorſal ones, which are ſituated near the fifth vertebra of the thorax. And, 3. The bronchial, tracheal, and thyroide, already deſcribed.

The uſe of the œſophagus is for deglutition, and a commixtion of the liquid, ſerving for digeſtion.

CHAP. VII.

Of the Neck, which is the third part of the trunk.

263. THE neck, *collum*, is that ſlender part of the trunk ſituated between the thorax and the head, and extending from the ſternum and clavicles to the head.

It conſiſts of, 1ſt, The common teguments. 2. The vertebræ, uſually ſeven in number. 3. A number of muſcles, ſerving to move the head, the neck, the larynx, the pharynx, and the os hyoides. 4. A number of very large arteries, as the carotids, internal and external, and the vertebral ones. 5. Of large veins, as the jugular, internal and external, and the vertebral ones. 6. Of large nerves of the par vagum, the intercoſtals, the recurrent, the diaphragmaticks, and the vertebral. 7. Part of the ſpinal marrow. 8. The aſpera arteria, or trachea, particularly the larynx, in which is an eminence called the pomum Adami. 9. The pharynx, with a part of the œſophagus. And, 10. The thyroide, with ſome other ſmaller glands.

264. We have already treated of the vertebræ, the aſpera arteria, and the œſophagus; and we ſhall hereafter treat of the ſpinal marrow, the arteries, the veins, and the nerves, in their places.

All

All that it was neceſſary to do here was to enumerate them, not to paſs over the neck unregarded, as many of the anatomical writers have done. Tho' its ſeveral parts are, according to our own plan, to be treated of ſeverally in other places, yet it is neceſſary to know them in their ſituation. The neck contains parts as neceſſary to life as any diviſion of the body; and hence Ariſtotle, Ruffus, Oribaſius, Coiterus, Riolanus, Ruyſch, Morgagni, and others, have agreed in making it a diſtinct part in the diviſion of the body, as not only a part of the utmoſt importance, but which could not properly be referred either to the head, or to the thorax.

CHAP. VIII.

Of the Head, the fourth part of the trunk.

265. BY the term *head*, caput, the anatomiſts underſtand what they call the fourth part of the trunk, comprehending that portion of the human frame which is placed above the upper vertebra of the neck.

The figure of the head is roundiſh, but oblong, ſomewhat approaching to an oval, prominent both before and behind, but flatted at the ſides, and that in ſuch a manner, that the anterior part, eſpecially about the forehead, is narrower than the poſterior. When the head is of a contrary ſhape from this, or even when it but recedes conſiderably from it, it is a deformity, and generally is the occaſion as well as indication of a diſtemperature of the ſenſes.

The ſize of the head is to be proportioned to that of the body: when either too ſmall or too large for it, the conſequence is not only a great impairing of the ſymmetry and beauty of the whole, but of the reaſon.

The head is ſituated at the top of the body, for the ſake of the more commodious lodging of the organs of ſenſation in it: theſe ſerve as a kind of centinels to the ſoul, and are therefore moſt conveniently placed in the higheſt poſition.

Anatomiſts divide the ſuperficies of the head into two parts; that which is covered with hair, and that which is not. That part of the head not covered with hair, is called the face; and in it are the organs of the ſeveral ſenſes, the eyes, noſe, &c. That part which is covered with hair, is called by ſeveral names in its ſeveral parts: the anterior portion of it is called ſinciput; the poſterior, occiput; the upper part, the bregma and vertex; and the ſides, the temples.

The parts of which the head is compoſed are of two kinds: the continentes, or containing; and the contents, or contained.

266. The continent or containing parts of the hairy portion of the head, are in part common, in part proper. The common are the cuticle, or epidermis; the cutis, which is very thick; and the fat. There is but little of this about the ſkull; but about the cheeks there is conſiderably more.

The proper or peculiar continent parts are, 1. The hairs, of which we have treated already. 2. The four muſcles of the cranium, which are very thin: two in the fore part, and called frontales, or frontal muſcles; and two in the hinder, called occipitales, or occipital muſcles. Theſe cover the upper part of the ſkull with their tendons, as with a kind of helmet. But of theſe we are to ſpeak more at large hereafter, in our Myology.

3. The pericranium is a membrane immediately inveſting the cranium, and is thin, but conſiderably firm and ſtrong. This coheres with the cranium, with the adjoining muſcles, and with the dura mater. The pericranium may be divided into two parts, an exterior and an interior membrane; and hence ſome have divided it into two ſeparate portions, under two diſtinct names of the pericranium and the perioſteum; but this diviſion is not eſſential or neceſſary.

It has a very great number of blood-veſſels in common with the other parts of the head; and its nerves are from the vertebræ of the neck, and the ſeventh pair of the brain.

Its uſes are, 1. To ſupport the veſſels, for the nutrition of the cranium. 2. To occaſion ſenſation in the cranium, which, as a mere bone, would, without this membrane, have been wholly inſenſible.

The fourth of the proper continent parts of the head is the cranium itſelf, which is intended for the defence of the brain, and is merely and intirely boney. It is compoſed of eight robuſt bones, joined by ſutures. Of theſe we have already treated in our Oſteology. In this place we are only to obſerve, that, in order to the examination of the internal parts of the head, the diſſector is to cut the ſkull tranſverſely, in half, with a ſaw; and the upper half being then carefully lifted off, there will be obſerved a number of rediſh dots, which ſhew where it has adhered by veſſels to the dura mater internally, by which it is nouriſhed.

The parts contained in the head are the brain, &c.

267. In our examination of the brain, which is the primary ſeat of the ſoul, we are firſt to obſerve its three membranes, which are called

menynges and matres. Theſe are, 1ſt, The dura mater. This is a robuſt and thick membrane, compoſed of tendinous fibres, and ſituated immediately under the cranium [*]. In this we are to obſerve the red ſpots, made by the ſeparating the cranium from it, and ſhewing the places of their adheſion. Its figure and magnitude correſpond exactly with thoſe of the brain. It is joined in every part to the ſkull; only that, in the upper part, it adheres more laxly than elſewhere: in the lower part it is moſt firmly connected, and it adheres, tho' not very firmly, to the parts placed under it. It has its arteries from the carotids, and they are beautifully ramified in it, in the manner of little ſhrubs [†]. Its veins are of two kinds; ſome, as in the other parts of the body; and others peculiar, of a triangular figure, and robuſt, and called ſinus's.

Many anatomiſts ſpeak of a great number of theſe [‡]; others make them only four, or at leaſt allow only four principal ones. Theſe are, 1ſt, the ſagittal, or longitudinal. This running from the forehead to the occiput, thro' the middle of the brain, terminates, in fine, in two lateral ones, which repreſent the figure of the Greek circumflex, and empty themſelves on each ſide into the jugular veins: theſe are to be ſeen when the brain is taken out. The fourth comes from the part where the pineal gland is ſituated, and is inſerted nearly in the part where the three juſt deſcribed meet [§]. That part is called the torcular herophili [‖]. The ſmaller ones are numerous, and are placed within the brain: of theſe we ſhall ſpeak hereafter in their place. The inſertion of the veins of the brain into theſe ſinus's, is very ſingular and remarkable.

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[*] See Pacchion. de dura mater.

[†] See Ruyſch's Theſ. 5. T. 2. fig. 4.

[‡] See Ortlob. Oecon. Animal. fig. 1. and Vieuſſens in Neurolog.

[§] See Ridley's Anat. Cereb. fig. 4.

[‖] See the ſame.

In our examination of the dura mater, we are alſo to obſerve the glandulæ conglobatæ Pacchioni *, which are ſmall; and the chordæ tranſverſæ of Willis, which ſerve to prevent the too great extenſion of the ſinus's.

The uſe of the ſinus's of the dura mater is to carry the blood from the brain, by a very peculiar mechaniſm.

The dura mater has nerves, for ſenſation, from the fifth and ſeventh pair of the brain. It has been aſſerted by many alſo, that it has lymphaticks in conſiderable number; but they have not yet been abſolutely demonſtrated.

The dura mater has alſo three proceſſes, 1. The falciform, ſo called from its figure, reſembling that of a reaper's ſickle: this is placed between the two hemiſpheres of the brain. 2. The proceſs between the cerebrum and cerebellum. And, 3. That in the diviſion of the cerebellum, of very important uſe.

The dura mater has a motion, which Baglivi and Pacchion. will have to be peculiar to itſelf, and of the muſcular kind; but it appears much more naturally to depend upon the pulſations of the arteries of the brain †.

The uſes of the dura mater are, 1. To ſerve in the place of a perioſteum to the internal parts of the ſkull. 2. To defend the brain. 3. By its proceſſes to prevent the compreſſion, which both the cerebrum and cerebellum would otherwiſe be liable

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* See Ridley's Treatiſe de dura mater.

† See his Account in the Philoſ. Tranſ. 1703.

liable to. And, 4. By means of its ſinus's, to give warmth to the brain.

268. The arachnoides is the ſecond coat or membrane of the brain. It is extremely thin and delicate, and has its name from the reſemblance it has to a ſpider's web. It is ſituated immediately under the dura mater, and occupies the ſpace between that and the pia mater. It is connected ſo cloſely with the pia mater, in the upper part of the brain, that it cannot be ſeparated without tearing: but in the lower part, and eſpecially about the cerebellum, the medulla oblongata, and ſinus's, it is connected ſo looſely, that it is eaſily diſtinguiſhable without cutting; notwithſtanding that ſome, to this time, doubt, or totally deny, its exiſtence; or agree with Ridley *, calling it only the exterior lamella of the pia mater. It is extended as far as the dura mater, covering the whole brain, and the ſpinal marrow intire: it covers the latter, however, only in a very looſe manner; and is beautifully and diſtinctly ſeen on it, when ſuſpended in a clear glaſs with ſpirit of wine.

There are blood-veſſels delineated by ſome authors †, as belonging to the tunica arachnoides; but it is not eaſy to find them in the membrane itſelf: it rather looks of the nature of the epidermis, which has no blood-veſſels at all.

Santorini has, however, diſcovered certain glands between this membrane and the dura mater, about the trunks of the veſſels, which ſerve for the ſecretion of a certain fluid within the cavity, between theſe membranes ‖.

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* Anatom. cerebri.

† See Bidloo's Anat. corp. hum. T. 8. fig. 5.

‖ Obſerv. Anat. p. 52.

The uſe of tunica arachnoides is to ſerve as a covering to the brain; for it does not appear, that ſo thin a membrane, and that deſtitute of veſſels, can be of any other uſe to ſuch important parts as the brain and the ſpinal marrow. Santorini * well obſerves, however, that as the pia mater deſcends deeply into the cavities between the anfractoſities, or windings of the brain, this membrane is always, in that caſe, ſo regularly ſtretched over it, that the veſſels, which paſs under it, are ſtrengthened by it; and that it connects the ſides of theſe frequent furrows, or ſulci, and abſolutely prevents the poſſibility of any thing getting into them, that might poſſibly be noxious to the brain. This is a very important uſe of this membrane, tho' merely as a covering of the brain; and the accurate author has made it out very plainly and perfectly.

269. The third tunic, or membrane of the brain, is the pia mater. This is placed immediately under the tunica arachnoides, and is cloſely and firmly connected to the brain, which it immediately ſurrounds. The pia mater is not only extended over the whole ſurface of the brain, but it inſinuates itſelf into all its cavities, and is carried down to the bottom of all its furrows in its anfractuoſities. It covers alſo the ſpinal marrow, and all the nerves: hence its ſuperficies is much greater than that of any other of the membranes of the brain.

It adheres very firmly to the brain itſelf, in a healthful ſtate; but, in hydropical caſes, it is rendered much looſer. It adheres alſo to the tunica arachnoides very cloſely and firmly, in the upper

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* Obſerv. Anat. p. 53.

part of the head; but much leſs ſo below with the dura mater. It has no other connection, except by the veins running to the ſinus's.

Its blood-veſſels are common to the reſt of the brain, and are very numerous; ſo that it ſeems in a manner wholly compoſed of them, as Ruyſch firſt ſhewed by his injections. The arteries are from the internal carotids and vertebrals. The veins, ſome of them, diſcharge themſelves into the ſinus's of the dura mater; others immediately into the jugular and vertebral veins. There are no nerves, yet diſcovered, entering the ſubſtance of this membrane, nor any lymphaticks. Willis and others have attributed glands to the pia mater, and given them the office of ſecreting a peculiar liquid, deſtined for the lubricating of the menynges; but theſe are, in general, found only about the longitudinal ſinus; or ſeem to be the ſame with thoſe mentioned before, S. 268. and which Santorini has aſcribed to the tunica arachnoides.

The uſe of the pia mater is to ſupport the blood-veſſels of the brain, which it alſo ſerves as a covering to, that they may be the more conveniently diſtributed, by this means, thro' all the furrows and anfractuoſities, for the ſecreting the proper fluids in the brain, and forming the animal ſpirits.

270. After the examination of the membranes inveſting the brain, we come to the conſideration of the brain itſelf. Its figure is roundiſh; but with ſome inequalities and furrows, called anfractus and gyri, which give it ſomewhat of the appearance of the inteſtines, as they lie together in their place. It is divided into two hemiſpheres,

by means of the proceſſus falciformis of the dura mater, already deſcribed; and theſe are again divided into the anterior and poſterior lobes.

The human brain is, in general, ſo large as to weigh about four pounds. It is nearly three times as much in quantity as the brain of an ox.

Its ſubſtance, on cutting off a part of it, is found to be of two kinds; an exterior one, called the cineritious or cortical part; and an interior, called the medullary.

The cortical part of the brain is about a ſixth of an inch in thickneſs, and it penetrates in the ſerpentine mazes and furrows, deep into the brain. Its ſtructure, according to Malpighi, Bidloo, and moſt of their followers, is declared to be glandulous; but Ruyſch, Berger, and Vieuſſens, have proved, by their injections, that it is almoſt intirely vaſcular *; at leaſt, it does not appear that the glands the former authors ſpeak of, are, or ever have been, fairly demonſtrated.

The ſtructure of the interior or medullary part of the brain is fibrous and tubular. It has its origin from the extremely ſmall arteries of the exterior or cortical part, and its termination is the beginning of the nerves. It is ſomewhat harder than the cortical part.

When the two hemiſpheres of the brain are drawn back, the corpus calloſum comes in view: this is whitiſh, hard, and joins the two hemiſpheres. In this part Lanciſi and ſeveral others have ſuppoſed the ſoul particularly to reſide †.

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* See his Epiſt. 12. and his Theſaur. Anat. in ſeveral places. Alſo Berger in his Phyſiologia; and Vieuſſens in his Nov. Syſtem. vaſorum.

† See Diſſertat. de Sede animæ cogitantis. Camerar. in Elect. Med. p. 18.

The ventricles of the brain are certain remarkable cavities. There are uſually reckoned four of them: two anterior ones, which are very large, and which ſhew themſelves, when the brain is taken off, down to the corpus calloſum, by an horizontal ſection. In the examination of theſe we are to obſerve, 1. The ſeptum lucidum, or pellucid partition, which offers itſelf to view between theſe two cavities, as ſoon as the corpus calloſum is raiſed. This ſeptum is compoſed of a fine medullary ſubſtance, and is formed into two ſides, or parietes, with a longitudinal cavity between them. It is covered with the pia mater; and it divides the two ventricles, as the mediaſtinum does the cavity of the thorax. Galen, and other of the old authors, have called it diaphragma cerebri.

2. The fornix: this is ſeen under the ſeptum lucidum; and is compoſed, like it, of a medullary ſubſtance. Its anterior part riſes with a double baſe; but the two parts ſoon unite: the hinder part is, however, again bifid. The bifid part is called, by ſome, crura fornicis; by others, pedes hippocampi.

3. The plexus choroideus, which is very full of veſſels; but has no glands. This is beautifully delineated by Ruyſch †.

4. The corpora ſtriata, which are of a greyiſh colour on the outſide, and ſtriated within.

5. The thalami nervorum opticorum. Theſe are white on the outſide, and greyiſh within; and between theſe and the crura of the medulla oblongata, is ſituated the third ventricle of the brain ‡. In this, after we have examined part of the plexus

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† See his Epiſt. T. 15.
‡ See T. 4. in this work.

choroides, we are to obſerve the glandula pinealis, or pineal gland. This is of a greyiſh colour, and its proceſſes and baſe are often medullary. This gland has alſo, by many, been ſuppoſed the peculiar ſeat of the ſoul.

After this we are to obſerve the nates and teſtes; and under theſe the valvula magna, cerebri, and the aquæduct of Sylvius, the poſterior orifice of which is called its anus, and its anterior vulva and rima. This makes a communication between the two anterior ventricles, and the fourth, which is continuous to this: but all theſe are moſt conveniently ſeen when the brain is taken out of the ſkull. The fourth ventricle is a cavity between the cerebellum and the medulla oblongata. It is conveniently ſeen when the brain is taken out, and the cerebellum diſſected.

271. After examining the cavities or ventricles of the brain, we are to look into the cerebellum. This is ſituated under the poſterior lobes of the brain, and the hinder proceſſes of the dura mater, in the lower part of the cavity of the ſkull. Its figure approaches to a globular one. Its ſuperficies is leſs anfractuous, or gyrated, than that of the brain; but it is furrowed: the furrows are deepeſt and largeſt in the middle; and from thence they gradually grow ſmaller every way, in form of ſo many ſegments of circles, till by degrees they terminate in what is called the vermiform proceſs.

The ſubſtance of the cerebellum, if cut into the right and left parts, appears much the ſame with that of the brain; but the cortical part is here much more in quantity than the medullary: this, in a very elegant manner, reſembles a kind of ſhrubs, or little trees; the trunks of which form what are called the peduncles of the cerebellum.

bellum. Tho' the brain has its ſeveral cavities, the cerebellum has none.

The lobuli of the cerebellum adhere in cluſters, in the manner of leaves on trees, to the arbuſculi medullares, already mentioned: they are very beautifully ſeen, on dividing the cerebellum; and are ſurrounded with the pia mater, and compoſe the far greater part of the ſubſtance of the cerebellum *.

The peduncles of the cerebellum conſiſt of three medullary proceſſes. The firſt aſcends from the cerebellum towards the teſtes, and forms what is called the valvula magna of the brain. The ſecond forms the annular prominence of Willis; and the third deſcends to the ſpinal marrow.

272. The medulla oblongata is the lower and medullary part of the cerebrum and cerebellum, formed into a kind of tail, and extended to the great foramen or hole in the occipital bone of the cranium, where it gives origin to the ſpinal marrow, and to the nerves of the brain †.

In taking the brain carefully out of the ſkull, there are diſtinguiſhed, in the lower part of this, the nerves of the brain, which are uſually called ten pair, but are properly only nine; and are, for the ſake of memory, reduced into the form of two Latin verſes:

Olfaciens, cernens, oculoſque movens, patienſque,
Guſtans, abducens, audienſque, vaganſque, loquenſque.

At the ſame time alſo we are to obſerve the ingreſs of the internal carotids into the ſkull; the infundibulum, and its inſertion into the pituitary gland; and, finally, the acceſſory ſpinal nerve of Willis *.

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* See T. 4. in this work.

† Schelhammer, and many others, ſuppoſe this to be the common ſenſory. See Anal. Diſſ. 13.

After the brain is taken out, we are to obſerve, in its lower part, the anaſtomoſes of the carotid and vertebral arteries †, and their diſtribution thro' the brain ‡, the crura of the medulla oblongata of the brain, and the crura or peduncles of the cerebellum, from which ariſe the medulla oblongata, and the ſpinal marrow; the origin of the ſeveral pairs of nerves of the brain; the two orbicular protuberances, behind the infundibulum; the auricular protuberance of Willis, called alſo the pons varoli, very ill deſcribed and delineated by Willis and others, but very well by Ruyſch §; the end of the medulla oblongata, and, in this, the pyramidal and olivary eminences, deſcribed by Vieuſſens ‖ and Ruyſch ¶: and, finally, the tunica arachnoides, which is very finely diſtinguiſhable in this part.

In the upper part of the brain, when turned up, we are to obſerve the fourth ventricle, and the calamus ſcriptorius, with its crena; all the other parts, which have been already deſcribed as belonging to the third ventricle, and the ſubſtance of the medulla oblongata, which is, in its external part, medullary; and, within, contains ſomewhat of the cortical or cineritious ſubſtance.

The veſſels of this part, and of the whole brain, are arteries and veins, very diſtinguiſhable and obvious; and authors have added nerves and lymphaticks; but theſe are not ſo eaſily diſtinguiſhable.

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* See his de Cerebro, fig. 1. M. M.

† See Ridley, l. c. fig. 1.

‡ See Ruyſch's Epiſt. probl. T. 13, and 15.

§ See Ruyſch's Epiſt. probl. 15.

‖ See T. 4. R. S.

¶ See Epiſt. T. 14.

guiſhable. The arteries are from the carotids and vertebrals: the carotids ſent branches into the cranium, thro' the ſingular canals of the os petroſum; the vertebrals thro' the great foramen of the occipital bone: they make ſeveral ſurpriſing inflexions. The veins ſcarce penetrate into the internal ſubſtance of the brain; but, ariſing from the cortical part, they are inſerted into the ſinus's of the dura mater.

The uſes of the brain, in general, are, 1ſt, To be of the utmoſt importance and aſſiſtance to the animal functions. 2. To ſecrete the animal ſpirits, and to tranſmit them to the nerves, for the neceſſities of ſenſation and motion.

The cerebrum is ſuppoſed to be particularly conſtructed for the ſecretion of the animal, the cerebellum for the vital and natural ſpirits. The peculiar uſes, to which the ſeveral particular parts of the brain are deſtined, are wholly unknown.

273. The medulla ſpinalis, or ſpinal marrow, is a continuation of the medulla oblongata of the brain, and forms, as it were, a kind of tail to that part. It is included in a kind of boney canal, formed by the vertebræ, and in this is continued, from the head to the extremity of the os ſacrum.

Its length is therefore the ſame with that of the ſpina dorſi, which is different in perſons of different ſtature. Its thickneſs, in general, is about equal to that of a finger; but it is not uniformly of the ſame diameter throughout. Its proper integuments are no leſs than ſix: theſe are, 1. The boney canal, formed by the cavities of twenty-four vertebræ, and the os ſacrum. 2. The tunica, which is very ſtrong, and connects the vertebræ within. 3. The cellular or adipoſe coat, which, in fat perſons, always contains more or leſs fat, and ſeems deſtined by nature to ſerve for the ſoftening the former. 4. The dura mater, which is ſtronger in the upper part, and finer and weaker in the lower: this looſely encloſes the medulla in the ſpine, and, in its anterior part, is firmly connected with the vertebræ. 5. The tunica arachnoides, which, in its anterior part, adheres very firmly to the pia mater; but in its poſterior part is looſe and fluctuating. The ſixth and laſt covering of the ſpinal marrow is the pia mater: this ſurrounds every part of the ſpinal marrow, and all the nerves that ariſe from it, and enters alſo its longitudinal diviſion.

The diviſion of the ſpinal marrow is formed by means of a fiſſure: it is by this ſeparated, according to authors, into a right and left part, or into two columns; but this ſeparation is not continued to the centre.

The arteries and veins of the ſpinal marrow enter at the apertures of the vertebræ, which give paſſage out to the nerves: they make a multitude of anaſtomoſes, and are derived from the vertebrals of the neck, the intercoſtals, and the lumbar.

The nerves of the ſpine are thirty-one, or, as others count them, thirty-two pair. Theſe are compoſed each of a multitude of fibres, ariſing from the anterior and poſterior parts of the medulla: theſe fibres afterwards unite, and are connected by and covered with membranes, and in that ſtate they conſtitute what we call nerves.

The ſubſtance of the medulla ſpinalis, in the upper part, as far as to the laſt vertebra of the thorax, is the ſame with that of the medulla oblongata of the brain; but ſomewhat tougher and more firm: they are externally of a medullary ſubſtance, that the nerves may eaſily make their way out; internally cineritious, and of the ſame nature with the cineritious or cortical part of the brain: but the lower part of them, from the laſt vertebra of the thorax to the extremity of the os ſacrum, is fibrous and very tenacious, and is called by authors cauda equina.

The uſes of the ſpinal marrow are, 1. To give origin to the before mentioned pairs of nerves, which are principally diſtributed to the limbs and external parts. And, 2. To ſecrete and prepare a nervous fluid for their purpoſes.

274. After the taking the brain intirely out of the ſkull, there yet remain, for our obſervation, the egreſs of the nine pair of nerves of the brain, and the ingreſs of the arteries of the brain, and thoſe of the dura mater; as alſo the larger ſinus's of the dura mater, the ſecond, third, and 4th already mentioned, S. 267.

The inferior ſinus of the falx, and the circular one*; what are called the receptacula plana, the pituitary gland by the antients†, and ſeveral other ſmaller ones in the baſis of the cranium‡, together with their various ways out of the cranium§, and their ingreſs, which is partly into the occipital and vertebral veins, but more uſually into the jugulars.

We are alſo to obſerve the rete mirabile, which is a plexus of veſſels and membranaceous fibres, in manner of a net, ſituated on each ſide, near the pituitary gland, and under the dura mater, where the circular ſinus is. This is found to be much larger in ſome quadrupeds than in the human frame; but its uſe is hitherto unknown.

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* See Ridley, fig. 2.

† See Morgagni, Adv. 6. p. 7.

‡ See Vieuſſen's Neurograph. T. 17. Ortlobſ. Hiſt. Part. and Morgagni Adverſ. 6.

§ See Santorini, who deſcribes theſe under the names of the various emiſſarii.

After this we are to obſerve the pituitary gland: this is a ſmall gland, ſituated in the ſella equina, between the duplicature of the dura mater, and has a cavity in it *.

It has its name from its uſe, which is the abſorbing the pituitary matter of the brain.

It has two membranes, 1. It is ſurrounded and ſupported by the dura mater †. 2. By a thin membrane, analagous to the pia mater, and perforated for the infundibulum. Its ſize and ſhape are nearly thoſe of a common kidney-bean; but it has an appendage in its poſterior part. It is uſually larger in quadrupeds than in the human frame. Its ſubſtance is glandulous; its colour, a pale whitiſh red: it is uſually conſiderably hard and firm; but ſomewhat ſofter, and of a greyiſh colour, in the appendage ‡.

It has arteries from the carotids: its veins run to the neighbouring ſinus's. Its nerves are from the fifth pair. Its excretory duct is probably the infundibulum already mentioned; for there does not appear to be any other.

The uſe generally attributed to this gland is the abſorbing the pituita of the ventricles of the brain, and afterwards diſcharging it §. But there does not ſeem a ſufficient foundation for this ſuppoſition; ſince, 1. The proper office of a gland is to ſecrete a fluid, not to receive one already ſecreted: 2. Becauſe a ſimple canal would have anſwered ſufficiently to ſuch a purpoſe, and the

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* See Littre's Account in the Memoirs of the Paris Academy, 1700.

† See the ſame in the ſame paper.

‡ See Morgagni, l. c. p. 31.

§ See Brunner de Gland. pituit. &c.

apparatus of a gland had been therefore unneceſſary. And, 3. Becauſe its ſubſtance is ſo hard and firm, as to render it very improper for ſuch a uſe *.

275. After having gone thro' the examination of thus much of the head, we now are to proceed to the face, or that part of it which is not covered with the common long hair. The parts of the face, that are to come under our conſideration, are of two kinds; the continent, or containing, and the contained.

Of the continent parts of the face, ſome are common, others proper, or peculiar. Of the number of the common ones, are, 1ſt, The epidermis. 2. The cutis. From the colour and fineneſs of theſe two parts ariſes the principal beauty of the face. 3. The fat, which is in conſiderable quantity, and in this part is frequently alſo covered with a panniculus carnoſus, adding much to the beauty of the face.

The proper continent parts of the face, are, 1. The muſcles, as the frontals, thoſe of the noſe, of the lips, of the lower jaw, and the reſt; of which we ſhall treat in the Myology. And, 2. The bones, which we have already deſcribed in the Oſteology.

The contained parts are, the organs of the five ſenſes: of ſeeing, taſting, ſmelling, hearing, and feeling. The laſt of theſe, however, more accurately ſpeaking, belongs to the whole ſurface of the ſkin.

The organs of ſight are the eyes. In theſe we are to obſerve their ſituation, in the upper part of the face, by means of which we are able to ſee to a greater diſtance than we otherwiſe could; their figure, which, excepting for the external

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* See Drake's Anthropol. p. 490.

parts, is globular; and their colour, which, in the human ſpecies, is variable; in ſome black, in others brown or hazel, in ſome greyiſh, in ſome blueiſh. The parts which are deſtined for the aſſiſtance of ſeeing, but do not enter into the compoſition of the eye, are the eyebrows, the eyelids, and the muſcles of the eyes.

The eyebrows, ſupercilia, are two hairy arches, extended over the orbit of the eyes: they are compoſed of hairs of a peculiar kind, and of a determinate length, all turned toward the temples; and under theſe, of a thick ſkin and ſome fat, by means of which they are raiſed, and become more eminent. That part of the eyebrows where they approach one another, about the root of the noſe, is called their head; the oppoſite extremity is the tail. Their uſe is to prevent the ſweat, trickling from the forehead, from getting into the eyes, and for moderating the force of the light from overhead.

The eyelids, palpebræ, are the integuments of the eyes: there are two of them to each, an upper and an under; and, at their joining, there are formed two corners, called canthi, an interior and larger, and an exterior and ſmaller: they are capable of cloſing and opening at pleaſure, by means of muſcles.

They are compoſed of the epidermis, the cutis, which is there very thin, and an arched cartilage, called the tarſus of the eyelid; and are lined, on their inner ſurface, with a fine and delicate ſoft membrane, very ſenſible, and continuous to the perioſteum, and to the albuginea of the eye *.

The eyelaſhes, cilia, are certain rigid hairs, ſituated on the arch or tarſus of the eyelids, and bent in a very ſingular manner. They are deſtined

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* See Ruyſch's Theſ. Anat. 10. p. 2.

for the keeping external bodies out of the eye, and for moderating the influx of light.

The muſcles we ſhall ſpeak of, in their proper place, in the Myology.

The glandulæ ſebaceæ of Meibom, are ſituated in the interior ſurface of the eyelids *. They ſerve for the ſecretion of an oleaginous fluid, which is of great uſe in preventing the attrition of the eyelids, from their continual motion. After theſe we are to obſerve the caruncula lachrymalis, which is ſituated in the larger angle or canthus; where there are alſo ſometimes ſome hairs †, and certain little glands; and the ſemi-lunar membrane §, ſerving to direct the tears to the puncta lachrymalia.

The glandula lachrymalis is ſituated in the orbit, above the ſmaller angle, with its excretory ducts under the upper eyelid ‡. Theſe are much more eaſily demonſtrated in the eye of an ox than in a human one.

The puncta lachrymalia are two: they are ſituated in the larger canthus or angle, at the extremities of the tarſi or cartilages. They terminate in the ſaccus lachrymalis, the naſal canal, and in the noſe itſelf ‖. They were known as early as in the days of Galen.

The uſe of the eyelids is to cover and defend the eyes, to wipe off foulneſſes from the cornea, to moderate the influx of light at pleaſure, and, by their frequent motion, to occaſion a ſecretion of a neceſſary fluid from the glands.

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* See Epiſt. de vaſis palpebr. nov.

† See Morgagni's Adverſ. 1. S. 22.

§ See the ſame in the ſame place.

‡ See Steno de gland. ocul.

‖ See Morgagni, T. 4. fig. 1. and Verheyen, T. 28. fig. 9. Alſo Bianchi's Duct. lachrymæ.

The muſcles of the eyes, ſerving to their motions, are, in the human frame, ſix in number, four ſtrait, viz. The attollens, deprimens, adductor, and abductor; and two oblique, the ſuperior and inferior: but of all theſe in the Myology.

Between and among theſe there is a conſiderable quantity of fat, ſerving for various very important purpoſes.

The proper parts of the eye, which form its globe or bulb, are the coats or tunics, the humors, and the veſſels.

The coats of the eye are ſeveral: 1. The albuginea, adnata, or conjunctiva, which adheres only to the anterior part of the eye: this joins the eye to the orbit, and is extremely full of veſſels. 2. The cornea, which is convex, pellucid, and diviſible into various lamellæ. 3. The ſclerotick, which is hard, opake, and is extended from the cornea to the optick nerve, in which what are called the aquæducts of Nuck are to be obſerved; but theſe are not truly aquæducts, but blood-veſſels of the eyes*. 4. The choroides, placed immediately under the ſclerotica, the interior lamella of which is called tunica Ruyſchiana: both this and the other are very full of veſſels, and coloured black†. 5. The uvea, which is the interior part of the choroides, and is ſeen thro' the cornea: this is convex, and we are to obſerve in it,

1. Its anterior coloured ſurface, called the iris, which is entirely vaſcular‡, and from which ariſes the variety of colours in the human eyes. 2. The

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* See the author's Diſſertat. de tunic choroid.

† See Ruyſch's Epiſt. 13. T. 16. and Theſaur. Anat. T. 2. fig. 1. and Hovius de circ. ocul.

‡ See the ſame in the ſame place.

pupil or foramen, which is round in the human eye, and is nearly in the middle of the iris *, and is capable of dilatation and contraction. 3. Its poſterior ſurface, which is black; and in which, when this blackneſs is cleared away, there appear the ſphincter of the pupil, formed of circular fibres for contraction; the ciliary fibres or proceſſes for the dilatation of the pupil; the ciliar ligament for the motion of the vitreous and cryſtalline humors; the arterial and venal circles, from which the veſſels are, in a wonderful manner, diſtributed over the uvea, the choroides, the ligamentum ciliare, and the vitreous and cryſtalline humors †; the ductus nigri, ſo called from their black colour, and placed between the proceſſes and the ligamentum ciliare; the ſpace between the uvea and the cornea, called the anterior camera of the eye; and that between the uvea and the cryſtalline, called its poſterior camera, which is either much ſmaller ‡, or entirely wanting §.

Many authors have alſo attributed glands to the uvea; but this is leſs certain, whether properly or not, they are ſo difficult to be diſtinguiſhed, if there be any.

Finally, we are to mention the retina: this is a very delicate, tender, and, as it were, mucous coat of the eye; or, more properly, it is only an expanſion of the optick nerve at the bottom of the eye: it is a primary part of the eye, and the great organ of viſion, for the ſake of which all the reſt were formed.

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* See Winſlow in the Memoirs of the Paris Acad. 1721.
† See Ruyſch and Hovius, before quoted.
‡ See the author's Diſſertation on the Cataract.
§ See Winſlow, where quoted above.

The humors of the eye are generally eſtabliſhed to be three: their office is to ſerve for the expanſion of the coats, and for the refraction of the rays of light. They are diſtinguiſhed by the names of the aqueous, vitreous, and cryſtalline.

The aqueous or albugineous humor fills up both the cameræ of the eye, tho' the antients diſtinguiſhed theſe cameræ by the name of the empty place, or locus vacuus of the eye *. In this the uvea fluctuates, as it were, and moves at liberty: this humor, when loſt by accident, will be repaired by nature.

The vitreous humor, ſo called from its reſemblance to glaſs in fuſion, is much like a fine clear jelly in its appearance. It conſiſts probably of extremely fine veſicles, containing a limpid and perfectly pellucid humor †. This fills the poſterior part of the eye, and is every where contiguous to the hinder part of the retina, which it ſerves alſo to expand.

The cryſtalline humor is nearly of a lentiform figure: it is more firm and ſolid than the reſt, and might be more properly called the cryſtalline body, or cryſtalline lens, than the cryſtalline humor. This is included, by the aſſiſtance of an extremely fine tunic or coat, in the fovea of the vitreous humor; and is ſuſpended, by means of the ciliar ligament, between the aqueous and vitreous humour, immediately behind the pupil: in this place it hangs free, and is moveable, by means of the ligament juſt mentioned. It is compoſed of a multitude of lamellæ, like the coats of an onion;

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* See Celſus, l. 7. c. 7.

† Morgagni, Adverſ. 6. rightly obſerves, that we only ſpeak of this fabrick from conjecture: Riolanus was the firſt who ſpoke of it; and, after him, Hovius treated of it as a certainty.

and theſe are alſo pellucid and vaſculous *. Often alſo there is a ſmall quantity of the aqueous humor contained within or under its coat †.

Tunica arachnoides.

After theſe three humors of the eye, we are to obſerve the tunica arachnoides: this is an extremely thin and fine vaſculous membrane, which ſurrounds the cryſtalline and the vitreous humor ‡, and by the aſſiſtance of which the cryſtalline lens is lodged in the fovea of the vitreous humor. On the cutting or breaking of this membrane, the cryſtalline falls out.

The blood-veſſels are next to be conſidered: theſe are diſtributed, in an amazing manner, thro' the internal parts of the eye §. Arteries from the external and internal carotids go to the eye in many different parts ‖. There are alſo a number of extremely minute ones, which convey only a fine and ſubtle lymph thither, by which the tunics and humors of the eye are nouriſhed. The veins partly carry the blood back to the ſinus's of the dura mater, and partly to the jugulars.

Beſide theſe veſſels, Valſalva aſſures us, that he diſcovered a number of true and proper lymphaticks in the eye of an ox.

The nerves of the eyes are very numerous. They are, 1. The optick nerve, which, by its expanſion, forms the retina of the eye, which is the primary organ of viſion: this enters the eye from the ſide of the noſe. Beſide this, there are the third and fourth pair of the brain, and a fifth and ſixth branch diſtributed about the muſcles,

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* See Hovius, l. c.

† See Morgagni's Adverſ. 6. p. 90.

‡ See Ruyſch's Theſaur. 2. T. 1. fig. 8.

§ Some anatomical writers have denied the exiſtence of this tunic; but it is eaſily demonſtrated in diſſection, &c.

‖ Ruyſch and Hovius have demonſtrated this.

¶ See our author's Diſſertation de tunica choroidea.

membranes, eyelids, and the lachrymal ſucculus and gland. But of theſe we ſhall have occaſion to ſpeak more at large in our Neurology. See S. 299.

The tongue. 277. The primary organ of taſte and of ſpeech is the tongue, *lingua*. In our conſideration of this organ, we are alſo to take cognizance of the other parts of the mouth placed about it, and aſſiſting in the ſame offices: theſe are the ſalival glands, the os hyoides, the gums, the palate, the lips, the uvula, and tonſils.

278. The glands ſerving for the ſecretion of the ſaliva, are the parotids, the maxillares, the ſublinguales, &c.

The parotids are two very remarkable glands, ſituated, one on each ſide, between the ear and the angle of the lower jaw, and they often extend themſelves over a great part of the maſſeter: from each of theſe there runs a very large duct, about three fingers long, and of the thickneſs of a wheat-ſtraw: it has a great number of roots. Steno has the honour of being the firſt diſcoverer of this: he found it, in diſſection, in the year 1660*. It is called by ſome, from his name, ductus ſalivalis Stenonius; by others, ductus ſalivalis ſuperior. It paſſes over the maſſeter muſcle, thro' the middle of the cheek, and there perforates the buccinator muſcle, and the membrane of the mouth, near the ſecond or third of the ductus molares; and at this perforation it diſcharges a very large quantity of its proper fluid into the mouth.

The maxillary glands are alſo conſiderably large ones: they are placed, one on each ſide, in the interior ſide of the angle of the lower jaw. Theſe have alſo each a ſingle duct, formed from the conjunction of a great number of roots, which is ſomething ſlenderer than the ducts of the former, but is uſually longer. Theſe are called by ſome, from their inventer, or ſuppoſed inventer, Wharton, ductus Whartonianæ [*]; by others, ductus ſalivales inferiores. Theſe open into the mouth ſometimes by a ſingle, ſometimes by a double, and ſometimes by a triple orifice under the tongue, near the root of the frænulum [†].

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* See Steno's Obſerv. Anat.

The ſublinguals are alſo two glands of an oblong form, ſituated, one on each ſide, under the tongue; from whence their name. It has been hitherto generally believed, that, in human ſubjects, theſe diſcharge their ſaliva into the Whartonian ducts, juſt deſcribed.

Rivinus [§], however, in the year 1679, firſt diſcovered a duct running from each of them, in a calf [‡]; and afterwards Bartholine made the ſame diſcovery in the mouth of a lion [||]: hence theſe ducts are indifferently called the Rivinian or the Bartholinian ducts. In human ſubjects it is otherwiſe: in theſe Morgagni firſt diſcovered, that they open into the mouth, between the ſides of the tongue and the gums, by very ſmall and ſcarce perceptable apertures [¶]. Our author, after the information he received of this from Morgagni, found them alſo, in diſſection, opening in this manner; and has given a drawing of them in the ſeventh Tab. Fig. 33.

After theſe we are to obſerve the foramen linguæ, called cœcum by authors, and figured by

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[*] See Adenograph. cap. 21.

[†] See Ruyſch's Theſ. Anat. 1. p. 25.

[§] Diſſertat. de Dyſpenæa.

[||] De ductu ſalivali novo.

[¶] Adverſ. 6. p. 131.

Collins *, and Morgagni †; as alſo in our fourth plate, fig. 20. Vater ‡ was the firſt who ſuppoſed this to be a ſalival duct; and proved, by a number of experiments, that it communicates with the glandulous ſubſtance about the root of the tongue: but he did not explain, very clearly, how this communication was effected. Coſchwitz §, however, afterwards took conſiderable pains to ſhew this, and to explain in what manner it is that ſeveral of the ducts run thro' the maxillary and ſublinguale glands, and have their various places of excretion in the tongue. The author has taken conſiderable pains in this attempt; but whether nature varies in this, as in many other circumſtances of ſuch kinds, or from whatever other cauſe it may be, we cannot ſay that every thing this author has deſcribed, appears juſt as he lays it down in diſſections. In human ſubjects there are ſometimes found two remarkable ducts, indeed, terminating in it: theſe are figured in Tab. 8. Fig. 34 and 35.

After this we are to obſerve two glands, one on each ſide, which open into the mouth by ſeveral oſculæ, near the poſterior dentes molares of the upper jaw. Theſe are very obvious in ſome ſubjects, but not ſo in others: theſe, as found in the ſame ſubject, from which the figure of the former was taken, are figured in our Tab. 8. Fig. 36 and 37.

In the ſame ſubject there was alſo diſcovered a duct, under the anterior apophyſis of the os occipitis: it was conſiderably large, and, on being preſs'd, it diſcharged a quantity of a mucous humour

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* See his Anat. T. 2.

† Adverſ. 1. T. 1.

‡ Peculiar Diſſert. de novo ductu ſaliv.

§ Diſſ. de ductu ſalivali novo.

mour into the fauces. This is alſo figured T. 8. Fig. 38. It is not ſo obvious in other ſubjects; but it is worth ſearching after with attention, to know whether it be general, or were a particular part there.

Beſide the glands already deſcribed, there are alſo certain miliary and lenticular ones, placed in conſiderable numbers about the membrane of the mouth, particularly about the lips, the palate, the cheeks, and the tongue: theſe, according to their different ſituation, may be called linguales, labiales, buccales, palatinæ, and uvulares; or by other names, from the parts they are formed in.

Theſe are the glands ſerving to ſecrete the ſaliva in the human frame. In dogs there are two other very remarkable ones, called, from their diſcoverer, glandulæ Nuckianæ *: they are ſituated, on each ſide, near the eyes; and they ſend down their ducts into the mouth, near the laſt but one of the dentes molares of the upper jaw. Nothing analogous to theſe is found in man.

279. The os hyoides, called alſo by ſome os linguale, and os bicorne, has been already ſpoken of in the oſteological part of this work, S. 106. Its deſcription will be found there; but it is neceſſary, in regard to its connexion with the tongue, and the uſe it is of to it, to ſay ſomething of it here. It coheres with the baſe of the tongue; ſo that it is ſituated between the tongue and larynx, and moves with the tongue. It is connected with the tongue, the larynx, and the ſtyloide proceſſes of the head, by ligaments, and by the intervention of muſcles, not only with the parts already mentioned, but alſo with the jaw, the clavicles, the ſcapula, and the ſternum. It has five pair of muſcles, by means of which it is

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* Nuck's Sialograph. p. 15. T. 3. fig. 1 and 2.

variouſly moved, together with the tongue: theſe muſcles will be hereafter deſcribed in our myological part.

The uſes of the os hyoides are, 1. To afford a firm and ſtrong baſe to the tongue, and to be inſtrumental to its various motions, and to deglutition. And, 2. To give a fixed point to a number of the muſcles.

280. The lips next come under conſideration: they are two, an upper and an under. They are compoſed principally of muſcles, and are covered externally with the general integuments; and, internally, with the membrane of the mouth. Under this membrane there are, in both the lips *, a great † number of miliary and lenticular glands. The prolabia, when the epidermis is taken off, after macerating a ſufficient time in water, are found to have alſo a multitude of nervous papillæ; and hence it is, that they are ſo extremely ſenſible ‡. Each of the lips has its peculiar frænulum: the upper one, under the noſe §; the under one, near the roots of the dentes inciſores ||; and they are of the utmoſt ſervice to us in ſpeaking, and eating and drinking.

281. The gums come next to be examined: they conſiſt of the common membrane of the mouth, and the perioſteum, of the jaws, to which they adhere very cloſely and firmly. They are furniſhed with a vaſt number of blood-veſſels, whence their florid red colour; and they ſerve for the covering of the jaws, and the keeping the teeth faſt in their ſockets.

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* See Cowper's Myotom. reformat. fig. 4.

† See our eighth plate, fig. 36. d d.

‡ See Ruyſch's Theſaur. 2. p. 26.

§ See Bidloo, T. 12.

|| See Morgagni, Adverſ. 5. fig. 1.

282. The palate has much the ſame ſtructure with the gums; but it has alſo a very great number of glands, diſcovered ſo early as in the time of Fallopius: theſe are principally ſituated in its hinder part, near the uvula, where it is pendulous in the manner of a curtain. This part is called the velum or clauſtrum of the palate. The glands ſituated particularly in this part, ſecrete a mucous fluid, ſerving to lubricate the mouth and throat, and to facilitate deglutition*: they have a great number of apertures there, for the diſcharging of this humor into the mouth. The great uſes of this membrane are, to defend the bones of the palate from corrupting; and for preventing, by its clauſtrum or velum, the things to be ſwallowed, from getting up into the noſtrils.

283. The uvula, called by Celſus the uva, and by others columella, is a part of a cylindrick, or rather a ſomewhat conic figure, hanging pendulous from the velum or clauſtrum of the palate, above the root of the tongue, between the two arches of the palate, as it were, and the tonſils †. It is, in figure, much like the laſt joint of a child's finger. Its ſubſtance is muſculous; its covering is of the glandulous membrane of the mouth. It has muſcles, by which it is variouſly moved, which are deſcribed in the Myology. And, finally, it has two membranaceous ligaments, by which it is connected with the bones of the palate.

The uſe of the uvula is not yet perfectly known: 'tis highly probable, however, that it is of aſſiſtance in modulating the voice. It has alſo a ſhare in preventing the drink, taken in at the mouth, from ruſhing up into the noſtrils. It is wanting in all quadrupeds *.

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* See T. 8. fig. 36. b b.

† See Ephem. Nat. Curioſ. Cent. 3. Alſo the Memoirs of the Paris Academy, 1718.

284. The tonſils, commonly called the almonds of the ears, are two remarkable glands, in ſome degree reſembling almonds in figure, and are ſituated one on each ſide of the mouth, near the uvula. They ſecrete a mucous humor for the lubricating the paſſages, and diſcharge it by ſeveral irregular but conſpicuous foraminæ into the mouth †.

The arteries of all theſe parts, namely, of the tonſils, uvula, gums, lips, palate, and ſalival glands, all are derived from the external carotids. The veins are from the jugulars, and the nerves principally from the fifth pair.

285. The tongue itſelf, the great organ of ſpeech, comes next after theſe parts to be examined. Its figure approaches, in ſome degree, to pyramidal. Its anterior part, which is ſmaller and moveable, is called its apex; and its poſterior, which is thicker and more fixed, is called its baſe or root. It is connected with the os hyoides, the lower jaw, the ſtyloide proceſs, the pharynx, the larynx, and the other adjoining parts, by means of a number of muſcles and membranes.

Its ligaments are, 1. The frænulum, placed near its apex on the under part, at the root of which the ſalival ducts of Wharton empty themſelves into the mouth. And, 2. A membranaceous ligament, by which it is connected with the lower jaw, the os hyoides, the larynx, and the epiglottis. In the middle of the tongue there is a longitudinal line, called linea mediana, which

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* When the uvula has been eaten off by the lues venerea, the voice has ſometimes ſuffered greatly, ſometimes very little from it.

† See Widman's Diſſertation, Eph. Nat. Cur. 3.

divides the tongue, as it were, equally into two parts.

The tongue is principally compoſed of muſcles, and of nervous involucra or membranes, and of fat, and ſome glands, and a number of veſſels.

Beſide the ſublingual glands already mentioned, there are frequently a great number met with on the ſuperior and poſterior part of the tongue: theſe are, in ſome ſubjects, as large as a ſmall pea, and ſhew an evident perforation in their centre *. The foramen cœcum, as it is called, of the tongue, is ſituate in the upper and hinder part of the tongue among theſe glands, and is often very conſpicuous, ſometimes not ſo much ſo. Its uſe was long unknown; but it is, at this time, found to be a true ductus ſalivalis †.

The arteries of the tongue are numerous and large: they come from the external carotids §. The veins of the tongue are ramifications of the external jugulars: of theſe ſome, which are ſituated under the apex of the tongue, are called venæ raninæ: theſe are ſometimes opened by ſurgeons for bleeding, particularly in diſorders of the fauces.

The nerves of the tongue are very remarkable ones. There are two branches from the fifth pair, which are uſually ſaid to ſerve for taſting; and two others from the ninth pair, which are ſuppoſed to aſſiſt its motions: but Boerhaave diſagrees with the common opinion in this reſpect, and ſuppoſes that the firſt pair ſerve to aſſiſt the motions of the tongue, and that the others are

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* See Morgagni's Adverſ. 1. T. 1.

† See Collins's Anatomy, T. 2. and Morgagni, Adverſ. 1, T. 1. As alſo our figure, T. 4. fig. 20.

§ See Ruyſch's Theſ. T. 3. ſi. 4. p. 45.

for the office of taſting[*]. Poſſibly both pair ſerve mutually for both purpoſes.

Coſchwitz[†] and Du Verney[‡] figure lymphaticks in the tongue alſo.

There are three involucra, tunics or membranes of the tongue, ſurrounding its muſcular ſubſtance. The external one is continuous with the common membrane of the mouth: this forms a number of vaginulæ, or caſes, of a pyramidal or of a globoſe figure: theſe are porous, and ſerve for receiving the nervous papillæ of the third membrane[§].

The ſecond or middle membrane of the tongue, called the reticular membrane of Malpighi, is compoſed of a very beautiful reticulation, and lets the nervous papillæ paſs thro' its apertures: this is conſpicuous only on the upper part; and, even there, is much more difficult to be ſeen in human ſubjects than in beaſts.

The third tunic is papillary and nervous: it is placed immediately under the reticular one, and is eaſily ſeen in the ſame parts of the tongue in the ſame ſubjects. This contains a number of nervous papillæ, which are of two kinds; the firſt, fungous or capitated, reſembling the horns of ſnails, or the young ſhoots of muſhrooms: theſe are full of little foramina, and may be thrown out or drawn back at pleaſure. The other papillæ are pyramidal in their figure: ſome of them are larger, ſome ſmaller, and moſt of them crooked[‖]. Both theſe kinds of papillæ ariſe from this inner or third membrane of the tongue, and from its nerves: they paſs thro' the foramina of the reticular or middle tunic, and terminate in the vaginulæ, or caſes, formed by the external membrane. Theſe papillæ are the primary organ of taſte.

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[*] See Ruyſch's Inſtitutes, cap. de Guſtu.

[†] Diſſert. de Duct. Saliv. nov.

[‡] See the ſame treatiſe.

[§] Ruyſch, Theſ. 1. T. 4. and Morgagni, T. 1. Adv. 1.

[‖] See Ruyſch, l. c.

The muſcles of the tongue, beſide thoſe belonging to the os hyoides, are four pair. Of theſe we ſhall ſpeak at large in our Myological part. Over the ſurfaces of theſe muſcles, however, there alſo run a multitude of irregular and inextricable fibres *; and it is by means of theſe that the tongue is occaſionally contracted and expanded, thruſt forward, and drawn back again, and performs all its other remarkable motions and changes of figure.

The uſes of the tongue are, the being the great organ of taſting and of ſpeech, and the ſerving to the comminuting, ſucking, and ſwallowing of our food; as alſo to ſpiting: but it is not ſo immediately neceſſary to all theſe, as has been ſuppoſed †.

286. As the tongue is the primary organ of taſting, that of ſmelling is the noſe. This part varies greatly in ſize and figure in different ſubjects: it is high in ſome, low in others, narrow in ſome, broad in others, and has a number of other leſſer variations. Anatomiſts divide its parts into the external and internal: its more obvious external parts are, the dorſum or back, the root, the ſpine, the orbiculus, and the alæ or pinnæ: theſe need no explication. The ſeptum

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[*] See Malpighi, de lingua.

[†] We have a remarkable inſtance in the Memoirs of the French Academy, 1718, of a girl born without a tongue, yet performing all the functions it is ſuppoſed to ſerve to; and in our own Philoſophical Tranſactions, we have an account of one Margaret Cating, who ſpoke without a tongue, well explained by Dr. Parſons.

is alſo of the number of the external parts: this divides the noſe into two parts, which are called nares or noſtrils. The hairs alſo are of this number: they are called by ſome vibriſſæ: they ſerve to hinder the mucus of the noſtrils from continually running out; and to prevent inſects, and extraneous ſubſtances of many kinds, from getting in. We are alſo to add to theſe the common teguments, namely, the epidermis, the fat, and the cutis. The upper part of the noſe is rigid, and compoſed of bones: the lower part is ſoft and flexible, and is compoſed of a number of cartilages, muſcles, and membranes.

The internal parts of the noſe are, 1. The bones: there are ſeveral of theſe go to the ſtructure of the noſe, as the oſſa naſi, the maxillaria, the os cribriforme, the oſſa ſpongioſa, the os frontale, the lachrymalia, the os palati, the vomer, and the os ſphenoides.

The cartilages, which form the lower part of the noſe, are connected by membranes, that the noſe may be flexible in that part: the firſt of theſe forms the anterior part of the ſeptum narium: there are two very large and conſpicuous ones in each of the alæ; and between theſe there are placed ſometimes two, ſometimes three, and ſometimes more, ſmaller ones *.

The ſeptum narium is cartilaginous in its anterior and lower part: in its poſterior and upper it is boney; and theſe parts are ſurrounded by robuſt and ſtrong membranes, which join them firmly together.

There are two paſſages from the noſtrils into the mouth, deſtined for the paſſage of air, and of the mucous matter. There are alſo ſinus's in

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* See Ruyſch's Epiſt. 8. fig. 4. and Drake's Anthropol. T. 17.

the mixillary, frontal, and ſphenoidal bones; and cellulæ in the os ethmoides, which increaſe the hollow of the noſe; and thus alſo give way to the greater expanſion of the pituitary membrane *.

There are alſo certain inequalities and eminences of the oſſa turbinata, or oſſa ſpongioſa of the noſtrils, which ſerve partly to the ſame purpoſes, and partly to prevent inſects, and other extraneous matters, and even the cold air, from getting immediately that way into the mouth.

There is alſo a ſoft and vaſcular membrane to be obſerved, which inveſts the noſtrils, and all their ſinus's and irregularities: this is called the membrana mucoſa, and pituitaria of Schneider †; and is the primary organ of ſmelling, and the place of ſecretion of the mucus of the noſtrils.

We are to remark alſo the oſcula, or openings of the excretory ducts, in this membrane: they are extremely conſpicuous in the head of an ox, in this part ‡.

There are alſo a number of little glands under this membrane §, eſpecially about the middle of the ſeptum ‖. Theſe are deſtined to the ſecretion of a mucous humor, like that of the reſt of the glands of this part.

The arteries, which are diſperſed in prodigious numbers thro' this membrane, ariſe from the carotids ¶: theſe ſerve alſo for the ſecretion of this mucus.

The veins are from the jugulars: by theſe the abundant blood, not employed for theſe purpoſes,

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* Delineated in Palfin's Oſteolog. T. 1, and 2. and by Drake, T. 18.

† See Schneider de Catarrhis.

‡ See Ruyſch, Epiſt. 8. T. 9. fig. 7.

§ See Ruyſch, where before quoted.

‖ See Morgagni, Adverſ. 6. Santorini, p. 91.

¶ See Ruyſch, l. c. fig. 6.

is returned. The nerves diſperſed thro' the membrana pituitaria, are, 1. The olfactorii, or olfactory nerves: theſe are ſufficiently obſervable; but they are leſs in human ſubjects than in quadrupeds*. They are ſuppoſed to be of uſe in ſmelling. 2. Some branches of the fifth pair, which terminate in the hairs: theſe conſtitute the true organ of ſmelling †.

Under the membrana pituitaria there is alſo another membrane, very thin, and ſerving to inveſt the bones and cartilages ‡; and called, where it ſurrounds the former, perioſteum; where the latter, perichondrium.

The foramina to be obſerved in the noſtrils, are, 1. Thoſe at the frontal, the maxillary, and the ſphenoidal ſinus's, and the cellulæ of the os ethmoides, ſerving for the communication of theſe ſinus's with the noſtrils. 2. The orifices of the lachrymal ducts, which open into the noſtrils: theſe are excellently figured by Morgagni §. And, 3. The ducts from the noſe into the mouth: theſe in a ſkeleton are open, and are obvious juſt behind the dentes inciſores of the upper jaw; but in diſſection of recent bodies, they are not found abſolutely to open into the mouth at all; nor, indeed, do they ſo in living ſubjects; for they are cloſed up by the membrane of the palate: the uſe generally attributed to them, therefore, of tranſmitting a mucous matter out of the noſtrils into the mouth, is very erroneous.

The uſes of the noſe are, to be of primary uſe in the ſenſe of ſmelling; to ſerve in the great office of reſpiration, and in the modelling the voice; to receive the abundant humors from the eyes, and to add to the beauty of the face. It is certain, that there is no paſſage for the air, much leſs for the powders ſnuffed up the noſtrils, to the brain. Whether there be any paſſages for the tranſmitting a mucous humor from the brain, to be diſcharged at the noſtrils, as the antients, and as Schelvogtius, and ſome other of the moderns, have ſuppoſed, is not yet aſcertained.

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* Schlevogtius denies this, and ſays they are only emiſſaries of the brain.

† See Santorini, p. 92.

‡ See Ruyſch, l. c. fig. 8.

§ See Ruyſch's Adverſar. 6.

287. The organs of hearing are the ears. Anatomiſts, in deſcribing theſe, uſually divide them into three parts; an exterior, a middle, and an interior. The exterior part is called ſimply auricula; but more properly by others, auris externa. In this there are a great many eminences and cavities to be obſerved; as the pinna and lobucle, the helix and anthelix, and the tragus and antitragus; the ſcapha, which is a cavity between the helix and the anthelix behind; and the concha, which is a larger cavity, ſituate before the meatus auditorius, or paſſage into the internal ear: in this we are to obſerve the glandulæ ſebaceæ of Valſalva *, which are mere cutaneous follicles; their ſubſtance is compoſed of the common integuments, and a cartilage.

The muſcles of the external ear are alſo to be carefully examined: they are in human ſubjects very ſmall, often ſcarce conſpicuous; ſometimes however two, ſometimes three, and ſometimes more of them, may be diſtinguiſhed. Theſe may be called, from their ſituation, the ſuperior, the poſterior, and the anterior. Their uſe in moving the ear, is evidently either none at all, or very inconſiderable: the moſt probable conjecture, as to their real uſe, is, that they ſerve to render the

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* Tract. de Hum. Aure.

ear tenſe, when we would hear more diſtinctly. We are alſo to obſerve the ligament, by which the poſterior part of the ear is connected to the os petroſum *.

After theſe we are to examine the meatus auditorius, or auditory paſſage. The courſe of this is tortuous and oblique, turning principally toward the anterior parts †. Its ſubſtance is partly boney, partly cartilaginous; and it is formed, as it were, of broken cartilages, covered with an elaſtick membrane: the membrane inveſting its internal part, is continuous with the cutis.

We are alſo to obſerve certain ſmall glands, of a yellow colour, called by Du Verney glandulæ ceruminoſæ ‡. Theſe are ſituated in the convex part of this membrane, about the middle of the paſſage. They ſerve to ſecrete the cerumen, which they depoſit, for various purpoſes, in the paſſage.

We are to obſerve alſo the corpus reticulare of Valſalva, in the areolæ or ſinus's, of which theſe ceruminoſe glands are contained §.

We are alſo, finally, to obſerve the hairs in the auditory paſſage, and their uſe.

The uſe of the external ear is to receive and convey ſounds, in the manner of an acouſtick tube, in order to our hearing them the more diſtinctly ‖.

The middle part of the ear, which comes next to be examined, is called the tympanum. In this we are to obſerve, 1. The membrana tympanis,

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* See Du Verney de Org. Auditus, T. 3. fig. 11.

† See Valſalva, T. 3. fig. 1, and 3.

‡ See Valſalva, l. c. T. 3. fig. 3.

§ L. c. T. 3. fig. 1, and 3.

‖ Schelhammer aſſerts, that he was the firſt who demonſtrated, that hearing is performed by means of ſonorous rays, as ſeeing is by means of viſual ones. l. c. n. 59.

panis, which is ſituated at the extremity of the auditory paſſage. Its ſituation is not perpendicular, but very oblique inwards. Its figure is elliptick; and its ſurface not plane, but concave. It is connected, in its circumference, with an annulus or ring, of a boney ſubſtance in infants, which becomes afterward transformed into the auditory paſſage; and in the middle it is connected with the little bone, called the malleus. Its ſubſtance is membranaceous: it is compoſed, indeed, of two or three lamellæ; and is furniſhed with a vaſt number of blood-veſſels, which were firſt diſcovered by Ruyſch *.

A great number of authors have followed Rivinus † in mentioning a natural foramen, or hole, very ſmall, and placed in an oblique direction, penetrating this membrane, and ‡ letting the ſmoak of tobacco, taken in at the mouth, find a paſſage thro' it out at the ears.

The boney cavity of the tympanum is to be obſerved as to its ſize, which is much ſmaller in human ſubjects than in quadrupeds. In this cavity we are to obſerve, the perioſteum, which is very thin, and is furniſhed with a great number of blood-veſſels; the chorda tympani, which is a little nerve, compoſed, by a combination of ramuli or little branches, of the fifth and ſeventh pairs: this is extended, in the manner of a cord, under the membrane of the tympanum.

We are alſo to obſerve here the three oſſicula auditus, covered with the perioſteum ‖: theſe are called the malleus, the incus, and the ſtapes. We

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* See Ruyſch, Epiſt. 8. p. 12. fig. 9.

† See Welſch. T. Anat. 49.

‡ See Valſalva, l. c. cap. 2. and alſo Drake's Anthropolog. p. 567.

‖ See Ruyſch, T. 8. fig. 1.

have already deſcribed them in our Oſteology, (S. 68.) But we are to add ſomewhat in this place, as to their connections, &c. The manubrium, or handle of the malleus, adheres to the membrane of the tympanum; and its head is articulated by ginglymus, with the body of the incus; and, finally, the longer leg of this is articulated by arthrodia, with the head of the ſtapes: the ſtapes alſo, at its baſe, adheres to the feneſtra ovalis, by means of a membrane.

The muſcles of the malleus are two, an external, and an internal: the ſtapes has but one *.

We are after theſe to obſerve the two feneſtræ, or openings, diſtinguiſhed by the names of the oval and the round feneſtra. The feneſtra ovalis leads to the veſtibule, on which ſtands the ſtapes. The feneſtra rotunda leads to the cochlea, and is cloſed by a membrane.

Beſide theſe feneſtræ, we are alſo to obſerve two other foramina. The one of theſe opens into the tube or duct of Euſtachius, and terminates in the mouth, almoſt immediately behind the tonſils: this duct is partly boney, partly cartilaginous, and partly membranous, and affords a communication between the mouth and the ears †. The other of theſe foramina goes to the cellulæ of the maſtoide proceſſes.

The third diviſion, or, as it is uſually called, the inner part of the ear, has, among anatomical writers, the name of the labyrinth.

In this we are to obſerve the veſtibulum, which is a cavity forming the middle part of the labyrinth: the paſſage into this is the feneſtra ovalis.

After this we are to obſerve the three ſemicircular canals, diſtinguiſhed by the names of the

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* See more of theſe in our Myology.

† See T. 8, fig. 38. c, d, e.

largeſt, the middle one, and the leaſt, which open by five orifices into the veſtibulum. Theſe are well figured by Du Verney and Valſalva.

After this we are to examine the cochlea of the ear. This is a part placed oppoſite to theſe canals, and formed in the manner of a ſnail-ſhell, forming in its progreſs two turns and a half, in a ſpiral form. In this we are to remark the nucleus, and the canal, which is divided into two by a ſpiral lamina. The upper of theſe opens into the veſtibulum, and is called ſcala veſtibuli; and the lower, which terminates in the hollow of the tympanum, through the feneſtra rotunda, is called ſcala tympani *.

We are alſo carefully to obſerve the very delicate and fine membrane, which is carried thro' all the cavities of the labyrinth: this is formed of an expanſion of the auditory nerve, and is the primary part of the organ of hearing; juſt as the retina is formed of the expanſion of the optick nerve, and is the primary organ of ſeeing. Theſe expanſions of the auditory nerve are called, by Valſalva, zonæ ſonoræ †. They are much more eaſily diſtinguiſhed in the ear of a ſheep than in the human ear: and in that of an eagle they have been found to be particularly plain and obvious.

We are next to obſerve the canal of the auditory canal, which is diſtinguiſhed into the common and the proper. The common canal is large, and there are foraminula in it, paſſing into the labyrinth. The proper one is narrower and longer, and is called the aquæduct of Fallopius: this terminates partly in the cavity of the cranium, and partly between the ſtyloide and maſtoide proceſſes ‖.

* See Valſalva de Aure hum.

† Valſalva de Aur. T. 8. fig. 8 and 9.

‖ Valſalva, T. 7. fig. 4.

The nerves of the inner ear, are, 1. From the auditory pair: this conſiſts of two parts or branches, a ſoft, and a harder: the ſoft branch or part is diſtributed through the labyrinth*; the harder part ſends off branches to the dura mater, the tympanum, and the external ear. 2. From the third pair of the vertebrals of the neck; but theſe are principally ſent to the external ear.

The arteries are from the carotids, both the external and internal.

The veins run partly to the jugulars, and partly to the ſinus's of the dura mater.

288. The organ of feeling is compoſed of the cutaneous papillæ: theſe are the villoſe extremities of the nerves of the ſkin, and are ſituated every where on its ſuperficies, but particularly in the palms of the hands, the ſoles of the feet, and the extremities of the fingers; in the laſt of which places they are more numerous than in any other part of the body: they are elevated a little, and are covered with the cuticle. Where they are moſt numerous, the ſenſation of feeling is moſt delicate; as has been already obſerved, where we treated of the integuments.

It is by means of theſe papillæ that we are endued with the ſenſe of feeling, from the texture, ſurfaces, and motions of objects; and the qualities ſenſible to the touch, ſuch as rough and ſmooth, dry and moiſt, hot and cold, hard and ſoft, are conveyed to us by no other means.

289. The ſenſe of taſte agrees extremely well, almoſt in every particular, with this of feeling. In this the nervous papillæ of the tongue, as they

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* See Valſalva, T. 8. fig. 8, and 9. There is a very ſingular account of the courſe of this nerve given by Simoncellius; but we are yet to enquire whether it be conformable to truth.

are differently affected by ſapid objects, excite in us the various ſenſations of ſweet and ſour, auſtere and mild, and the like.

It is much in the ſame manner alſo, that the nerves diſtributed in the manner of papillæ thro' the membrana pituitaria, affects us with the ſenſations we have of various ſmells: ſo that, upon the whole, the ſenſe of feeling ſeems almoſt a general and univerſal one; and the others may, perhaps, without impropriety, be called only ſo many different ſpecies of this.

A COMPENDIUM OF ANATOMY.

BOOK IV.

Of ANGIOLOGY.

CHAP. I.

Of the Arteries.

290. ANgiology is the doctrine of the blood-veſſels; that is, of arteries and veins. The term might be underſtood in a more comprehenſive ſenſe; but as cuſtom has eſtabliſhed this more limited one for it in anatomical writings, in this only we ſhall underſtand it in this place.

291. An artery is a tube or canal, endued with pulſation, elaſtick, and branched, and ſerving to carry the blood from the heart to the ſeveral parts of the body.

The arteries of the human body are, properly and ſtrictly ſpeaking, only two, 1. The pulmonary artery; and, 2. The aorta, or arteria magna. All the other arteries of the body, tho' diſtinguiſhed by particular names, are only branches of theſe.

The figure of the arteries is conoide: they begin from a larger baſe, and end in a ſmall point. Toward the extremities, however, they become merely cylindrick tubes of an extreme fineneſs; and theſe end in reticular plexus's, in pencils, ſpirules, and other figures; and, finally, go off into veins, lymphaticks, or excretory ducts. The arteries are of a membranaceous ſtructure: they are compoſed of five coats; the firſt is vaſcular, the ſecond cellular, the third tendinous, the fourth muſculous, compoſed of annular, and, as it were, tendinous fibres; and the fifth is nervous.

292. The pulmonary artery ariſes from the right ventricle of the heart, and is diſtributed only thro' the lungs, but that with a vaſt number of ramifications.

293. The aorta, called alſo the arteria magna, or great artery, ariſes, with a ſingle trunk, from the left ventricle of the heart, above its valves, called the ſemi-lunar ones: it preſently gives two arteries, called coronary ones, to the heart itſelf, and its auricles; and after this its trunk is bent, in the manner of an arch: and from this part it ſends, in human ſubjects, uſually three aſcending branches; from which are formed the two carotids, called, from their ſituation, the right and left, each of which, about the larynx, is wonderfully turned and bent in moſt ſubjects, and is divided into what are termed the external and the internal carotid.

The external carotid ſends branches to the larynx, the pharynx, and the muſcles of the os hyoides; the jaws, the tongue, the lips, the mouth, the noſe, the eyes, the ears, the temples, and, in fine, to all the external parts of the head.

The internal carotid enters into the cavity of the ſkull, and, after many inflexions, ſends branches to the ſeveral parts of the brain, the membranes of the brain, the eyes, the noſtrils, and the internal ears.

The ſubclavians are two; and from theſe ariſes, on each ſide, an artery, which is called the vertebral: theſe run up to the brain, between the foramina of the tranſverſe apophyſes of the vertebræ; and, after making many windings, enter the cranium, and are joined to the carotids, forming the cervicalis *, with the ſpinal †, and with theſe are diſtributed over the whole brain.

From the ſubclavians alſo ariſe the muſculares colli, which are uncertain both in their number and ſituation, and are diſtributed thro' the muſcles of the neck.

The external ſcapulary artery, which is ſent to the external parts of the ſcapula.

The ſuperior intercoſtals, which are diſtributed about the two or three firſt ribs, and the circumjacent parts.

The mediaſtinal artery, diſtributed thro' the mediaſtinum, thymus, and pericardium.

The ſuperior diaphragmatick artery, which deſcends to the diaphragm, and frequently gives branches to the parts laſt mentioned; particularly if the mediaſtinal artery, as is ſometimes the caſe, is wanting.

The mammary artery, which, running under the ſternum, deſcends quite to the abdomen, and ſends branches to the breaſts, the muſcles of the thorax, and thoſe of the abdomen.

And, finally, the axillary arteries, from which are derived the internal ſcapular, which goes to the

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* See Ridley's Anat. Cerebr. fig. 1. g.

† See the ſame in the ſame place.

the parts that lie under the ſcapula: the thoracick artery, or external mammary artery, which is diſtributed thro' the external parts of the thorax: and the brachial, which uſually deſcends undivided as far as to the bending of the elbow, only ſending off little branches to the arm; but, from this place downward, it is divided into two branches, the radiæus, and the cubitæus; and theſe are divided into a number of branches, which run to the hand, and to the ſeveral fingers. Sometimes, however, the brachial artery is in the upper part of the arm, and ſometimes in the middle, divided into branches; and many other variations of nature, from her ordinary courſe, are met with in different ſubjects, in regard to this diviſion.

After we have thus traced the aſcendent branches of the aorta, we are to examine its trunk, which deſcends, after an arch-like inflexion, thro' the thorax and the abdomen, down to the os ſacrum. This is uſually larger in women than in men: and from this ariſe, in their order,

The bronchial artery of Ruyſch; tho' this ſometimes alſo riſes from the intercoſtals *.

The inferior intercoſtals, which are diſtributed about all the ribs, except the two or three firſt; and ſend ramifications to the marrow in the ſpine, and to the muſcles of the abdomen.

The œſophagæan arteries, which run to the œſophagus, and have been obſerved but by few of the anatomical writers.

The inferior diaphragmaticks, which ſometimes alſo riſe from the cœliac.

The cœliac, which iſſues from the aorta, juſt below the diaphragm.

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* See Ruyſch's Dilucidat. Valvul. Lymphat. p. 61. and Epiſt. 6.

The right branch of this ſends out the right gaſtrick and epiploick, the pancreatick, and the duodenick, the hepatick and the double cyſtick arteries.

The left branch of it ſends off the left gaſtrick and epiploick arteries, the gaſtro-epiploick, the great ſplenick, and alſo many of the pancreatick arteries.

The ſuperior meſenterick next runs off from the deſcendent trunk of the aorta: this is diſtributed to the meſentery, and to the ſmall inteſtines. After this

The renal or emulgent arteries, which are ſometimes ſingle, ſometimes double, on each ſide; with theſe ariſe the

Atrabiliariæ, which go to the capſulæ atrabiliariæ; and the adipoſæ, which run to the adipoſe membrane of the kidneys; but theſe alſo often ariſe from the renals.

The ſpermaticks, which in men run to the teſticles, and in women principally to the uterus.

The inferior meſenterick, which goes to the larger inteſtines; and one branch of which, in particular, going to the inteſtinum rectum, is called the internal hæmorrhoidal.

The lumbar ones, which are various, and go to the muſcles of the loins, and to thoſe of the abdomen, and other of the circumjacent parts.

The ſacra, which ſometimes deſcends thro' the middle of the os ſacrum to the pelvis; ſometimes ariſes one from each iliac, and ſometimes is wanting.

And, finally, the two iliacs, each of which is again divided into two parts, the internal, and the external.

The internal branch of the iliac is commonly called the hypogaſtrick: this runs to the bladder, the inteſtinum rectum, where it is called the external hæmorrhoidal artery; to the parts of generation, the buttocks, and the adjacent parts.

The external branch of the iliac ſends out the umbilical artery *; the epigaſtrick, which runs thro' the muſculus rectus of the abdomen, up to the mammary one; the pudendal, which goes to the cutis of the pudenda; and, finally, the crural, which lies upon the vein †, and is divided into two parts; the external, which is ſmaller, and is diſtributed throughout the exterior part of the thigh; and the internal, which is larger, and forms the popliteæ, the ſurales, and the tibial arteries; and which is afterwards, from the extremities of theſe, divided into a multitude of branches, to which anatomiſts have given no names, in the foot.

CHAP. II.

Of the Veins.

294. A Vein is a veſſel which carries the blood from the ſeveral parts of the body to the heart. The primary veins of the human body are three: 1. The pulmonary vein. 2. The vena cava. And, 3. The vena portæ.

295. The pulmonary vein ariſes from the left auricle of the heart, where it firſt forms a ſinus; and is, ſoon after that, divided into four branches, and afterwards into innumerable ones, which are ramified, and diſtributed thro' the whole ſubſtance of the lungs ‡.

296. The vena cava ariſes, with a larger ſinus, from the right auricle of the heart: it there ſends

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* The origin of this, however, varies greatly.

† See Morgagni's Adverſar. 2. p. 87.

‡ See Drake's Anthropolog. T. 13.

out a vein to the heart itſelf, called the coronary vein; and is divided into two trunks, a ſuperior, and an inferior.

From the ſuperior trunk of the vena cava there ariſe the following veins:

The vena azygos *, from which ariſe afterwards the intercoſtal veins, and the œſophageæ.

The bronchial vein, which, in ſome ſubjects, indeed, does not riſe ſeparate; but comes from the azygos, and ſometimes from the intercoſtals, and is in ſome ſubjects wholly wanting.

The mediaſtinal vein, which accompanies the mediaſtinal artery.

The ſuperior diaphragmatick, which accompanies, in the ſame manner, the artery of that name; as the mediaſtinal does the mediaſtinal artery. And, finally,

The ſubclavians; from which ariſe, on each ſide,

The external jugular, diſtributed thro' the external parts of the head; and which, in its ſeveral parts, receives different denominations from them; ſuch as the frontal, the temporal, and the occipital, &c.

The internal jugular, which gives ramifications to the larynx, the pharynx, the muſcles of the os hyoides, and to the tongue: thoſe which are under its apex, are called raninæ. Beſide theſe branches, ſent off from different parts of the internal jugular, its trunk terminates in a diverticulum, called the jugular ſack, and brings back the blood from the ſinus's of the dura mater, and from the brain.

The vertebral vein, which aſcends to the cranium, thro' the tranſverſe apophyſes of the vertebræ of the neck, and runs to the lateral ſinus.

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* See Lanciſi; as alſo Morgagni, Adverſ. 5. 73.

The ſuperior intercoſtals, diſtributed about the two or three upper ribs.

The mammary veins, which accompany the mammary arteries.

The muſculares, which are of two kinds, the ſuperior, and the inferior.

The ſcapulares, which are alſo of two kinds, external and internal, and the external thoracick.

And, finally, the axillary; the exterior branch of which is called the cephalick, and is extended along the exterior part of the arm, toward the thumb: and its interior branch, called the baſilick; and in the right arm the hepatick; in the left, the ſplenick. The vena mediana is formed of the concourſe of theſe, in the flexure of the cubit. And, finally, that which runs over the back of the hand, towards the little finger, is called the ſalvatella.

The inferior trunk of the vena cava is remarkable for the valves, and from this ariſe the following veins:

The diaphragmatick, or inferior phrenick veins, running to the diaphragm.

The hepatick, which are large, and have many branches, and are ſent to the liver.

The renal veins, from the left of which riſes the left ſpermatick vein.

The atrabiliariæ and adipoſæ; but theſe are often only branches from the renal ones.

The right ſpermatick vein, and near it ſeveral lumbary veins.

The ſacra, which ſometimes is found double.

And, finally, the iliacs. From theſe, on each ſide, ariſe

The hypogaſtricks, from which branches run to the inteſtinum rectum, and to the anus: theſe are called the external hæmorrhoidal veins: and others to the bladder, the parts of generation, the buttocks, and the adjoining muſcles.

The epigaſtricks, the pudendal, and the muſculares, all which accompany the arteries of the ſame denomination.

The crural, which run to the feet; and the internal branch of which, toward the internal malleolus, is called the ſaphæna; and its external, about the knee, the poplitæa: in the intermediate part of the leg it is called ſuralis; and about the great toe of each foot, the cephalick vein of the foot.

297. The vena portæ has ſome kind of reſemblance to a tree, in its ſtructure *. Its roots, or inferior branches, are divided into the right and left.

From the right ariſe all the meſeriac veins of the inteſtines, the internal hæmorrhoidal, and the right epiploicks.

The left is called the ſplenic vein; and from this ariſe

The gaſtrick veins, which are various, and form the coronary vein of the ſtomach.

The vaſa brevia, the epiploick, and the gaſtro-epiploick veins.

The pancreatick, and ſometimes alſo the internal hæmorrhoidal vein.

The trunk of the vena portæ, which goes to the liver, affords the cyſtick veins, the right gaſtrick, the duodenal, and this often the pancreatick.

Laſtly, we are to obſerve its branches: where the trunk begins to explicate, it conſtitutes the ſinus portæ in the liver; and from this it is divided

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* This is elegantly and juſtly figured in Cheſelden's Anatomy, T. 16.

vided into innumerable branches, which are diſperſed thro' the whole ſubſtance of the liver.

298. The veins are compoſed principally of a membranaceous, a vaſculous, and a muſculous tunick; but theſe are vaſtly thinner than in the arteries. There are, in ſome of the branches of the vena cava, valves deſtined to be of ſervice in the circulation of the blood; but there are none in the vena portæ, nor in the pulmonary vein.

CHAP. III.

Of the Nerves.

299. THE nerves are cylindrick, whitiſh parts, uſually fibroſe in their ſtructure, or compoſed of cluſters of filaments, ariſing from the brain, or rather from its medulla oblongata within the ſkull, and from the ſpinal marrow, and running from thence to every part of the body. Neurology.

The nerves are uſually divided into two kinds: thoſe of the brain, and thoſe of the ſpinal marrow. The nerves of the brain are nine pair:

1. The olfactory, which paſs thro' the os cribroſum to the membrane of the noſtrils; ſome account of which has already been given, (S. 287.)

2. The optick, which, by their expanſion, form the retina of the eye.

3. The motory pair of the eyes, which are divided, each near the orbit, into ſix parts or branches: of which, in human ſubjects, the firſt branch goes to the elevator palpebræ; the ſecond, to the elevator of the eye; the third, to the depreſſor; the fourth, to the adducent; the fifth, to the inferior oblique; and the ſixth, into the tunics of the eyes; but in beaſts they are divided much otherwiſe.

4. The pathetick of Willis: this pair were known to Euſtachius. They are very ſmall, and run to the trochlear muſcle of the eye.

5. The guſtatory pair: theſe are very large, and are divided, within the cranium, into three branches, immediately under the dura mater. Of theſe, the firſt branch, called the ophthalmick, runs to various parts of and about the eye, the eyelids, the muſcles of the forehead and noſe, and the teguments of the face.

The ſecond branch may be called the ſuperior maxillary one, ſince, after it has made its paſſage out of the cranium by the foramen rotundum, it is diſtributed thro' all parts of the upper jaw, the lips, noſe, palate, uvula, gums, and teeth: a branch of it alſo runs to the ear, and this, joining with a branch of the ſeventh pair, forms the chorda tympani, already deſcribed in its place. Beſide theſe, it ſends off alſo one or two ſurculi, or little ramifications, in the cranium; and theſe, together with a little branch of the ſixth pair, ſometimes give origin to the intercoſtal nerve.

The third may be called the maxillaris inferior, ſince, after paſſing out at the foramen ovale of the cranium, it is diſtributed over the ſeveral parts of the lower jaw, the tongue, and teeth particularly. It is from the diſtribution of this part that the whole pair of nerves have obtained the name of par guſtatorium, tho' a great part of them ſerves to very different purpoſes, and is carried to parts that have nothing to do with taſting.

6. The abducent: this ſends out a branch for the formation of the intercoſtal nerve; but almoſt the whole of the nerve, except this, is carried to the muſculus abducens of the eye, whence the pair are named.

The intercoſtal nerve is formed either of ramifications of the two preceding nerves, or only of thoſe of the ſixth pair. It makes its way out of the cranium by the paſſage of the internal carotid, and deſcends, near the eighth pair, thro' the neck; and thence thro' the breaſt and abdomen, even to the pelvis; and, in its way, makes various plexus's and ganglia *, and ſends branches to almoſt all the parts contained in the breaſt and abdomen.

7. The auditory pair: theſe ariſe with two trunks, the one of which is called the portio dura, or hard portion; the other the portio mollis, or ſoft one. This laſt enters the foramen of the os petroſum, and thence, thro' various little apertures, gets into the labyrinth: it is there expanded over all its parts, and conſtitutes the primary organ of hearing.

The portio dura, or harder portion, paſſing the aquæduct of Fallopius, turns back one or more branches from the anterior ſurface of the proceſs of the petroſum into the cavity of the cranium; and theſe run to the receptacles, &c. under the dura menynx †. It ſends off alſo another branch internally, which, with the branch from the fifth pair, ſerves for the conſtruction of the chorda tympani: and it alſo ſends off a number of other ſmaller ramifications, which run to the muſcles, and other parts of the tympanum.

The reſt of this pair goes off to the external ear, the pericranium, the muſcles of the os hyoides, the lips, the eyelids, and the parotids.

8. The par vagum, (with the ſpinalis acceſſorius of Willis:) theſe paſs out near the lateral ſinus's of the dura mater, and, deſcending thro'

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* Of the fabrick and reſemblance of theſe, ſee Morgagni, Adverſar. 2.

† See the ſame, Adverſ. 6. p. 34.

the neck and thorax to the abdomen, ſend out branches by the way to the larynx, the pharynx, the heart, the lungs, and more than all to the ſtomach. It alſo ſends away, from the upper part of the thorax, large branches to the larynx, which, from this odd paſſage, are called recurrents; and, finally, theſe are variouſly implicated and entangled in the neck, the thorax, and the abdomen, with the linguals, the cervicals, and the intercoſtals.

9. The lingual pair go immediately to the tongue, and are called, by ſome, the motory nerves of the tongue; but by others, with more juſtice and propriety, guſtatoria.

Finally, we are to obſerve, that the pair of nerves, which the generality of anatomical writers, after Willis, have called the tenth pair of the head, are, for many unanſwerable reaſons, to be properly called the firſt pair of nerves of the neck.

300. The nerves of the ſpinal marrow are thoſe which ariſe from the medulla, or marrow contained in the ſpine; not from the brain. Of theſe there are properly thirty-two pair.

Thoſe of the neck are no leſs than eight pair, and from theſe there are innumerable branches diſtributed thro' the muſcles of the head, the neck, the ſcapula, and the humerus. From the third pair, in particular, there is a branch which runs up to the ear: from the third, fourth, and fifth pair are formed the nerves of the diaphragm, which, paſſing thro' the neck and the breaſt, deſcend to the diaphragm: the ſixth, ſeventh, and eighth pair of theſe, together with the firſt pair of thoſe of the back, after they have been joined by various anaſtomoſes, form the ſix robuſt nerves of the arm, which are diſperſed throughout the ſcapulæ, the arms, the hands, and the fingers.

To this diviſion alſo is the ſpinal acceſſory nerve of Willis to be referred, as a ſort of ninth pair of nerves of the neck: this ariſes from the ſpinal marrow, about the origin of the third or fourth pair, and paſſes thro' the great foramen in the os occipitis up into the cranium: it is then joined to the par vagum, and, coming out of the cranium again by the ſame aperture, it recedes again from the par vagum, and is bent back to the muſculus ſcapulæ cucullaris, or trapezius †.

The nerves of the back are twelve pairs: theſe, beſide the branch which they give to the brachial nerves, run intirely in the ſame furrow along the courſe of the ribs, and are diſperſed over the pleura, the intercoſtal, pectoral, and abdominal muſcles, the breaſts, and other parts of the thorax.

The nerves of the loins are five pair: they are, in general, diſperſed over the loins, the peritonæum, and the integuments and muſcles of the abdomen: and, beſide this, their firſt pair often gives, on each ſide, a branch to the diaphragm. The ſecond pair, after inoſculating with the branches of the firſt, third, and fourth pair, forms the crural nerve, which is diſtributed over the anterior part of the thigh; and in the ſame manner a branch is formed of the conjunctions of the ſecond, third, and fourth pair, which paſſes thro' the great foramen of the os pubis to the ſcrotum, the teſticles, and the adjoining parts.

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* Santorini obſerves, in oppoſition to Ridley, that this pair do not ariſe from the prior but from the poſterior ones, and not below the fifth.

† This is finely delineated by Du Verney in his Tract. de Aure humana, T. 11. fig. 1.

The fourth and fifth pair of the nerves of the loins, joining with the firſt, ſecond, third, and fourth pairs of the os ſacrum, compoſe the nerve called the iſchiatick, or the poſterior crural nerve, which is the largeſt in the human body: from hence it paſſes out between the muſculi glutæi of the pelvis, and deſcending along the hinder part of the thigh, between the two lower heads of the os femoris, it is divided into branches, which are diſtributed over the whole leg, the foot, and the toes. Before it goes out of the pelvis, however, it ſends off a number of branches to the bladder, the inteſtinum rectum, the genitals, and many of the adjacent parts.

The nerves of the os ſacrum, finally, are five pair, tho' not always determinately and regularly ſo: they paſs thro' the anterior foramina of this bone; and the ſuperior ones of them, as already obſerved, compoſe the iſchiatick nerve; and what remains is diſperſed, in a multitude of ramifications, over the parts contained in the pelvis, the inteſtinum rectum, the bladder, the parts of generation, and the other adjacent ones.

The poſterior foramina of this bone are very large; but thro' theſe there paſs no nerves, tho' many of the anatomical writers have unluckily aſſerted that there do. The reader, who would enter more deeply into the doctrine and diſtribution of the nerves, ſhould ſtudy Willis's Treatiſe of the Brain and Nerves, and Vieuſſen's Neurologia, where they are expreſſed by large, elegant, and accurate figures.

301. The ſtructure and fabrick of the nerves is pretty eaſily diſtinguiſhable in moſt of the larger and in ſome of the ſmaller ones. Beſide the blood-veſſels they receive, and the membranes they are ſurrounded with, they are ſeen to be compoſed

of a fibrous matter; or, as it were, of bundles or cluſters of white, cylindrick, and very ſlender filaments: theſe filaments, on the ſtricteſt examination we are able to make into their nature, appear to be ſolid, and without any cavity *. Much leſs are we to ſuppoſe, that any one ever ſaw a fluid contained in them, as too many authors, and thoſe of reputation, have attempted to perſuade the world they had.

Tho' we cannot diſcover, by our moſt nice enquiries, that there is any ſuch fluid as the animal ſpirits contained in the filaments of the nerves, or indeed that they have any cavity for the reception of it; yet it is very poſſible, that there may be ſuch cavities, tho' too ſmall for our diſcovery, and a fluid of a proportionable fineneſs and ſubtlety in them: and the following arguments have been urged, with great ſhew of reaſon, in ſupport of the opinion that it is ſo, and that theſe filaments are all veſſels.

1. Becauſe they ariſe from the brain and the ſpinal marrow, in exactly the ſame manner as the other ducts do from the other viſcera and glands; that is, they riſe from the extremities of the arteriolæ of the cortical ſubſtance of the brain.

2. Becauſe the vaſt abundance of blood, which is carried up into the head by four very large arteries, when we conſider that the liver is nouriſhed by a ſingle one, and that but a ſmall one, cannot be ſuppoſed deſtined to the nutrition of the brain alone, or at all neceſſary to it; nor indeed to be directed thither with any viſible intent, unleſs for the ſecretion of another fluid, and that in very large abundance, to be there made from it.

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* Lewenhoeck indeed affirms, that he had often found a cavity in them; but he is not free from errors in many of his microſcopial obſervations.

3. Becauſe the nerves continue to grow to be elongated, and to be nouriſhed, from the firſt period of the formation of the fœtus in the uterus to the full growth, and to extremeſt old age; which ſeems hardly poſſible to be explained any way, unleſs by ſuppoſing that there is a ſubtle fluid contained in them, which diſtends them, and preſerves them vigorous, after they have done growing.

4. Becauſe, on cutting a nerve aſunder, the ſenſation, motion, and nutrition of the part, into which it was inſerted, ceaſes. This ſeems to ſet the importance of the nerves much higher than that of any other of the veſſels, and to give proof that the influx of ſome fluid, of the utmoſt conſequence to the part, is prevented by the deſtroying the communication.

5. It is not only on the cutting a nerve aſunder that this happens, but alſo on the only tying one up; particularly on tying up the nerves of the diaphragm, in a living ſubject, its motion is always found to ceaſe; and on preſſing theſe nerves below the ligature, towards the diaphragm, there returns ſome motion in that part: and this ſeems to plead very ſtrongly in favour of there being ſome fluid in the cavities of theſe filaments, and for the motion of the diaphragm depending on it.

6. The buſineſs of ſleeping and waking ſeems not to be accountable for on any other plan, than that of allowing a fluid of this kind to the nerves. Certainly nobody yet has ſo much as tolerably accounted for it otherwiſe.

7. It is as impoſſible alſo to explain why it is, that ſo ſurpriſing a debility, eſpecially in people of not very robuſt conſtitutions, ſucceeds too free

a uſe of venery, unleſs by having recourſe to theſe animal ſpirits.

8. Nor, indeed, has any body yet been able to explain, without having recourſe to the ſame fluid in the nerves, that amazing debility that is the conſequence of too intenſe ſtudy; or that which accompanies many diſeaſes, and particularly that ſurpriſing loſs of ſtrength that is one of the conſtant ſymptoms in malignant fevers.

9. The poſſibility of a cavity in the nerves, and of a fluid being contained in that cavity, tho' we are able to diſtinguiſh neither the one nor the other, may alſo be eaſily evinced from the obſervation of the growth and nuturation of fruits. In the ſtalks of a cherry, for inſtance, we are only able to diſcover a ſet of fibres, which, like the white filaments of which the nerves are compoſed, appear to be perfectly ſolid: no cavity, nor any juice, ever was diſtinguiſhed in any of theſe filaments; yet it is very evident, that they muſt have cavities, and thoſe much larger than there is a neceſſity of ſuppoſing thoſe in the nervous filaments; ſince, unleſs a juice, and that of a much coarſer and thicker nature than we need ſuppoſe that of the nerves to be, paſſed thro' them, it would be impoſſible for the fruit to increaſe in ſize. The very ſtone, in this caſe, is formed of particles that have paſſed thro' cavities, thus imperceptible to us. And after we have been obliged to acknowledge this, ſurely it can be no great conceſſion to allow a poſſibility of cavities and a fluid in the nerves; the apparent neceſſity of which our reaſon plainly ſhews, tho' our bodily organs cannot ſhew its exiſtence.

10. Finally, thoſe who abſolutely deny the exiſtence of animal ſpirits, or of a fluid conveyed thro' the cavities of the nervous filaments, allow

no purpoſe, or at leaſt but a very inconſiderable one, for which the nerves themſelves can have been formed: if they ſay, that the ſoul works on the body by a contraction of the nerves, and thus produces motion, it may be anſwered, that no powers of contraction can be ſhewn to be in the nerves. And, beſide this, the phænomena already mentioned, from the tying up of a nerve, cannot be explicated any other way than by allowing the exiſtence of a fluid, whoſe courſe is thus ſtopt; for the ligature would not be of any force towards the preventing its powers of contraction, as is evident from the conſequence of tying a rope round, ever ſo firmly, in one part, with a thread: the power of contracting will not be prevented by that.

302. The great uſe of the nerves, therefore, ſeems to be, tho' we are not able perfectly to demonſtrate it, to convey to all parts of the body, nay, by their minute fibrils of the laſt diviſion, to every point of every part of the body, a fluid of an extremely ſubtle kind, ſecreted in the brain and in the ſpinal marrow, and deſtined for no leſs noble a purpoſe than the ſenſation, motion, and nutrition of the ſeveral parts of the whole human fabrick.

The reader, who would enter farther into this nice and important diſquiſition, would do well to read Boerhaave's chapter on the brain, in his Inſtitutes; and Morgagni's Adverſar. 2. p. 70. and the two ſucceeding ones; and the 29th and 30th of his ſixth Adverſ. where he treats judiciouſly and deeply on this ſubject; and, after theſe, Burggrave on the Exiſtence of the Animal Spirits.

There are many at this time who abſolutely deny the exiſtence both of theſe ſpirits, and of the cavities ſuppoſed to contain them, becauſe they can ſee neither; and ſome of them have gone ſo far as to cenſure, very ſeverely, thoſe who have aſſerted the exiſtence of them; tho' with no better proof againſt their exiſtence than this of their not having been able to make them the objects of their ſenſes. But it may be obſerved, that they reaſon very erroneouſly on the ſubject of this fluid, who ſuppoſe, from its offices, that there is any neceſſity of its being groſs enough to be obvious to our ſenſes: on the contrary, its effects ſeem rather, as Schelhammer has juſtly obſerved, to ſhew that it ought to be as ſubtile as penetrating, and as ſwift in its motions as light, and to diffuſe itſelf as univerſally and inſtantaneouſly thro' the places of its deſtination. Some inſtances we have given, ſeem to ſhew a neceſſity of all this ſubtility in it; and if we will allow it, that it follows evidently enough, that it is more proper to be an object of our reaſon than of our ſenſes, and to be ſeen by its effects rather than by its ſurface. We cannot ſee, nor ever can expect to ſee, the veſſels thro' which the fluids circulate in the legs of a mite; yet we are very certain, that there are ſuch veſſels and ſuch fluids there. The air, and many other exiſtences, might alſo be mentioned, as things which we never do nor ever can ſee; yet whoſe effects very plainly prove to us, that there are ſuch things.

A
COMPENDIUM
OF
ANATOMY.

BOOK V.

Of MYOLOGY.

CHAP. I.

Of Myology in general.

303. MYology is the doctrine of the muſcles, explaining their fabrick, their origin, inſertion, ſituation and uſe.

304. A muſcle is an inſtrument of motion: it is a part of the human body deſtined for the moving ſome other part, and that in general by a voluntary motion, or ſuch as is dictated by the will. It is compoſed principally of fleſhy and of tendinous fibres, which have alſo veſſels of all kinds, arteries, veins, nerves, and lymphaticks; all which parts are ſurrounded by or incloſed in one common membrane,

305. A muſcle is divided, by anatomiſts, into the body and the two extremities: the body is called, alſo the belly of the muſcle, venter; and

the two extremities, if they are white, are called tendons.

That extremity where the muſcle ariſes is called its head, *caput*, or its beginning, its origin, or its fixed point. Its other extremity, or end, is called its tail, its moveable point, and often its tendon; and, finally, this, if it be broad and membranaceous, is called an aponeuroſis.

306. The action of a muſcle conſiſts properly in the contraction of its belly, after whatever manner that is done: by this means its extremities approach toward one another; and by this means alſo the part, into which the end of the muſcle is inſerted, moves as if it were drawn by a cord. Schelhammer * is of opinion, that this contraction of the belly of a muſcle is performed by means of a corrugation of the fibres, in the ſame manner as we ſee an earth-worm ſhorten and contract itſelf by corrugating its ſkin, &c. Morgagni †, on the other hand, alledges, that, in order to underſtand the power of motion in a muſcle, we ought to attend to Wallis's experiment; by which it is evidently proved, that the ſmalleſt force imaginable of the air, driven thro' a cylindrick tube into a bladder, will, by diſtending its width, and ſhortening its length, cauſe it to raiſe up, and ſuſtain a weight of ſixty or ſeventy pounds.

Others have demonſtrated, by hydroſtatical principles, that a very ſmall quantity of a fluid, directed thro' a ſmall cylindrick tube, placed on a veſſel of a larger baſe, and already filled, will be able, in the ſame manner, to move and raiſe up a large weight: from which they ſhew that it follows, that the belly of a muſcle ſwells in the time of its contraction or action; and that this intumeſcence may, nay and muſt, have very great effects.

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* See his Analect. Anatom. Diſſert. 7.

† See his Adverſaria 5. p. 112.

On the other hand, there are, among the lateſt and moſt celebrated writers, ſome who affirm, that the belly of a muſcle does not ſwell, or become diſtended at all, in the time of its contraction: but it would be well, if the aſſerters of this opinion would, while they forcibly draw up the under-jaw to the upper, lay two or three of their fingers upon either the temporal or maſſeter muſcle; for, in this caſe, they will have the moſt evident of all conviction, that, while theſe muſcles act, their bellies are in reality diſtended, and rendered firmer. Or let them only, when the hand is placed in a proper ſituation, forcibly draw the thumb toward the firſt finger, and they may both ſee and feel, in the moſt evident manner in the world, that the muſcle between the thumb and the index ſwells, or is diſtended in its middle, as the action of drawing the thumb toward the finger is performed. A number of other inſtances of the certainty of this fact might be brought; but this laſt alone is ſo obvious and indiſputable, that more are not neceſſary *.

In many of the muſcles both the extremities are moveable: theſe properly have no fixed point at all; but in theſe, that part which, of the two, is leaſt moveable, is always called the head, or the fixed point, by the anatomical writers; and the more moveable part, or end, is called the tail, or the punctum mobile. This, however, cannot be done univerſally, ſince there are caſes in which

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* The reader, who would enter more deeply into this diſquiſition, may conſult Borelli de Motu Animalium; Bernouilli de Motu Muſcul. Berger's Phyſiolog. cap. 22. Boerhaave's Inſtitutes, in his chapter of Muſcular Motion; and Mead's Introduction to Cowper's Myographia.

that extremity of a muſcle, which was a little before the moveable point, becomes the fixed point; and that which was the fixed, becomes the moveable one. Examples of this we have in the ſcalein, the ſerrati antici, and ſome of the muſcles of the abdomen, not to mention any others.

307. Among the muſcles there are certain different ones, which conſpire in the ſame action, and ſo perform the ſame motions as aſſociates. Such are the flexors or extenſors of the arm, and the like: hence theſe, and ſuch others as conſpire in the ſame manner to the ſame action, are called by authors ſocii and congeneres.

When, on the other hand, we regard the contrary actions of certain muſcles, as the extenſors of any part which act quite contrarily to the flexors, theſe are called antagoniſt muſcles: in this caſe, both the kinds acting together, render the limb rigid or immoveable: this action of the muſcles is called motus tonicus. We are alſo to obſerve, on this occaſion, that ſeveral of the muſcles, conſidered ſingly and ſeparately, perform other kind of motions than thoſe aſcribed to them in regard to the whole part: thus the maſtoide muſcle, the rectus major capitis, &c. when they act on both ſides, bend the head forwards; but when only on one ſide, they draw the head obliquely downwards, and to one ſide. Hence, from the diverſity of the muſcles, which act either alone or conjunctly with their aſſociates, or with others, there ariſe ſeveral intermediate motions, quite different from the primary ones, and ſuch as have not hitherto been ſufficiently obſerved.

This does not only happen in regard to the muſcles of the head, the flexors and extenſors, and the like, but to ſeveral others; and particularly to thoſe of the eyes, the lips, the jaws, the tongue, the neck, the abdomen, the arm, the carpus, &c. Theſe we are carefully to attend to, and explain to ourſelves, by what particular muſcles, acting diſtinctively, they are performed; otherwiſe we ſhall never be able to underſtand the various and wonderful motions of the parts.

Winſlow's excellent obſervations on the actions of the muſcles, publiſhed in the Memoirs of the Paris Academy for the year 1720, deſerve to be carefully read on this occaſion. Among other curious things, this author ſhews, that a great many of the motions of the muſcular parts are not owing to the ſuppoſed contraction, but to the relaxation of the muſcles of the oppoſite ſide.

308. The muſcular fibres are, according to the action they are intended for, of various directions; ſome are ſtrait, others oblique, others tranſverſe, others annular, and others ſpiral.

309. Some of the muſcles conſiſt of one ſimple or uniform ſeries of fibres: theſe are from this diſtinguiſhed by the name of ſimplices. Others are compoſed of various and often contrary courſes of fibres; and theſe are ſometimes ſo cloſely and regularly arranged together, that they ſeem to form ſeveral ſeparate leſſer muſcles, and the large one conſequently appears to be compoſed of a number of others: theſe are therefore called compoſit muſcles. Steno, Borelli, and Lower, have excellently explained the nature of theſe kind of muſcles. The more of theſe cluſters of fibres, or ſmaller muſcles, there enter into the compoſition of a larger, the thicker and ſtronger it is.

310. The motions of the far greater part of the muſcles are voluntary, or dependent on our will: thoſe of ſome others are wholly involuntary. The former are called animal, the other

natural motions. Finally, the motions of ſome of the muſcles are of a mixed kind, partly animal, and partly natural. Thoſe muſcles which perform the voluntary motions, receive nerves from the brain or ſpinal marrow: thoſe which perform their motions involuntarily, have their's from the cerebellum: thoſe whoſe motion is partly voluntary, partly involuntary, have their nerves in part from the brain, and in part from the cerebellum. As we find, that a muſcle can no longer act, when its nerve is either cut aſunder, or tied up; ſo the ſame abſolute dependance it has on its artery. The experiments of Steno, and others, on living quadrupeds, ſhew that, on the cutting or tying up the artery, the muſcle in the ſame manner loſes its whole power of motion.

311. The muſcles generally receive their names from their fixed and their moveable points conjointly; ſometimes from the fixed point only, and ſometimes only from the moveable one: ſome of them alſo are denominated from their uſes, and ſome from their figure, or reſemblance to other things: and, finally, ſome from their place, their ſize, tuation, or their other qualities; as will appear more at large in our conſideration of the muſcles ſeparately. The figures of the muſcles moſt to be depended upon are thoſe of Veſalius, Drake, and Cowper in his Myotomia.

312. We ſhall begin to enumerate them from the head, thence deſcending regularly to the foot. After this, we ſhall enquire into their number; a thing moſt writers are ſtrangely diſagreed about, and that with very ſufficient cauſe, as nothing abſolutely certain can be eſtabliſhed about it: they are certainly more than five hundred in the whole body.

CHAP. II.

Of the ſeveral muſcles of the cutis of the head.

313. THE muſcles of the cutis of the cranium are four: two called frontal, and two occipital.

The frontal muſcles are very thin: they are ſituated under the ſkin of the forehead, and have both their extremities moveable, excepting only for a few fibres, which ariſe from the inferior edge of the os frontis. They are extended on each ſide, under the eyelids, from the orbicularis of the eyelids, near the larger canthus of the eye, beyond the middle of the orbit, toward the leſſer canthus, and extend ſomewhat obliquely outwards over the os frontis: after this they expand their tendons over the upper part of the cranium, and ſeem to be joined with the aponeuroſes of the occipitales, which are fixed. By this means they are able to move the ſkin of the forehead, and the eyebrows. The antagoniſts to theſe are the orbiculares palpebrarum, on which they are affixed.

The occipital muſcles are alſo uſually very thin: they ariſe, on each ſide, from the os occipitis, where it adheres to the temporal bones: they aſcend upwards over the oſſa bregmatis, and join their aponeuroſes with the frontal ones, to which they ſeem to afford their fixed point. They, together with the frontal ones, cover the head, as it were, with a helmet or cap, and they aſſiſt their actions*. Morgagni has obſerved, that theſe occipital muſcles are ſometimes intirely wanting; and at others, when not abſolutely deficient, that they are ſo thin that it is ſcarce poſſible to ſee them: ſometimes alſo they are larger than uſual, and are divided, as it were, each into two. It has been from an examination of them in ſome ſubject, in which they were of this kind, that Santorini * makes two occipital muſcles of each ſide.

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* Cowper is of opinion, that theſe two frontal muſcles may more properly be eſteemed one digaſtrick one. See his Myotom. fol. p. 16.

314. The eyebrow has only one muſcle: this is called its corrugator, or depreſſor. It riſes on each ſide from the root of the noſe, and is obliquely inſerted into the eyebrow. It moves the eyebrow downward; and when the two belonging to the two eyebrows act together, they draw them toward one another. The frontal muſcles, on the other hand, elevate the eyebrows. There ſeems ſome reaſon on the ſide of thoſe, who ſuppoſe this a part of the frontalis. Santorini judges it part of the orbicularis †.

315. The muſcles of the eyelids are three: the orbicularis, the elevator, and the depreſſor. The orbicularis, or conſtrictor of the eyelid, is ſingle: it riſes from the upper apophyſis of the maxillary bone, near the larger canthus of the eye, and ſurrounds the eyelid with a ſeries of orbicular fibres, ſerving to ſhut it: in this action alſo it depreſſes and draws forward the eyebrow ‡, and elevates the lower eyelid §.

The elevator proprius palpebræ ſuperioris, or proper elevator of the upper eyelid, has its origin in the bottom of the orbit, and its inſertion in the edge of the upper eyelid, near the cartilage of the tarſus.

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* Pag. 8 and 9. † Pag. 8 and 9.

‡ See Morgagni, Adverſ. 2. p 28.

§ See the ſame author, Adverſ. 6. p. 44.

The depreſſor palpebræ inferioris, or depreſſor of the lower eyelid, is a ſeries of fleſhy fibres, ſometimes thinner, ſometimes thicker, ariſing from the cutis of the cheeks, and ſometimes from the os jugalis, and is inſerted into the lower edge of the orbicularis: by theſe fibres it is, if we ſtrictly attend to it, that the lower eyelid is drawn downward, when we open the eye.

CHAP. III.

Of the muſcles of the eyes.

316. THE muſcles of the eye are ſeven in quadrupeds; but in man they are only ſix *, and are diſtinguiſhed into two ſets, under the names of recti and obliqui.

The recti are four: they ariſe near the ambit of the foramen of the optick nerve, in the fundus of the orbit; and are inſerted into the ſclerotica, not far from the ambit of the cornea †. They are, the ſuperior attollens, called alſo the ſuperbus, which raiſes the eye.

The inferior deprimens, called alſo the humilis, which draws it downward.

The exterior abducens, called alſo indignatorius, which draws it ſideways and outwardly.

The interior adducens, called alſo bibitorius, which draws it inwardly.

If two of theſe muſcles act conjunctly, the eye has an intermediate or oblique direction.

The oblique of the eye, called alſo rotatores, are two; a larger, and a ſmaller.

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* Theſe are finely figured in Euſtachius, T. 39.

† Morgagni, Adverſar. 6. 98. obſerves, that they are extended alſo to the eyelids, eſpecially the lower, and aſſiſt in their motions.

The obliquus major, called alſo obliquus ſuperior, and trochlearis, the greater, upper, or trochlear oblique muſcle of the eye, has its origin near the precedent; but it paſſes thro' a ſingular trochlea *, of an almoſt cartilaginous ſtructure, near the large canthus of the eye: from thence it again turns back, and is inſerted into the upper part of the eye, near its middle: hence it obliquely depreſſes the pupil, and, in ſome degree, draws it outward.

The obliquus minor, or inferior, the leſſer or lower oblique muſcle of the eye, ariſes from the anterior and inner part of the orbit, not far from the naſal canal: it ſurrounds obliquely the lower part of the bulb, and is inſerted into its exterior part, near the middle. Hence it moves the pupil of the eye obliquely upwards, which is very different from what has generally been ſuppoſed to be its effect. Both theſe obliqui acting together, draw the eye forwards; and thus they are the antagoniſts of the recti which draw it backwards.

The ſeventh muſcle of the eye, which is peculiar to quadrupeds, ariſes from the bottom of the orbit, from the whole circumference of the optick nerve: it ſurrounds the whole poſterior part of the ſclerotica, and ſeems deſtined to ſerve for the protuſion of the bulb of the eye.

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* See Morgagni, Adverſar. 6. 98. See alſo Winſlow's Memoir on this ſubject, in the Memoirs of the Paris Academy 1721.

CHAP.

CHAP. IV.

Of the muſcles of the ear.

317. THE muſcles of the external ear are frequently ſo very ſmall as ſcarce to be viſible; and ſometimes, indeed, they are abſolutely wanting: from this, and from their action being ſcarcely perceptible, Schelhammer has rejected them from among the number of eſſential or ordinary parts of the human body *. The antients ſeem alſo to have neglected them for the ſame reaſon; and Galen, in particular †, eſteems them rather the lineaments of muſcles than real and perfect ones. Columbus ‡ and Fallopius § were the firſt who deſcribed them with any degree of propriety; and they both agree in ſaying, that they are not found in all ſubjects. Fallopius in particular ſays, that he had ſometimes found three: the firſt of theſe, he ſays, was ſituated in the anterior part of the ear, ariſing from the extremity of the frontal muſcle, and thence deſcending very thin toward the ear, into the ſuperior and anterior part of which it is inſerted. The ſecond ariſes, with a thin and fine beginning, above the mamillary proceſs; and thence deſcending tranſverſely, it grows a little wider; and after it has divided into three fingers, as it were, it is implanted into the poſterior part of the ear. The third is a part of what is called the platyſma myoides; from which ſometimes there aſcends a part, which is inſerted into the lower part of the ear.

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* Tract. de Auditu, p. 1. c. 1. n. 7.

† De Uſu Partium, l. 16. c. 6.

‡ De re Anatomica.

§ Obſervat. Anatom.

Caſſerius * and Bidloo †, inſtead of three, reckon five; but Du Verney ‡ acknowledges only two, a ſuperior, and a poſterior: and Cowper § agrees, that this alſo has been the determination he has fallen into often, on an almoſt infinite number of examinations. Valſalva ‖ figures them, adding to theſe two another, under the name of an anterior one. After him, Vieuſſens deſcribes four, and countenances his determination, by expreſly ſaying, that he had examined the ear a thouſand times before he would venture to deſcribe them; and that his figures are ſo accurate, that nothing farther could be neceſſary on the occaſion ¶.

Santorini, who ſeems not to have met with this piece of Vieuſſens's, accuſes almoſt all the authors, who had gone before him, of great errors on this head, and gives a new delineation ** of the whole. It is probable enough, that all theſe authors, tho' they differ ſo extremely from one another, yet deſcribe what they ſaw; for the muſcles under conſideration vary ſo extremely, that they may have appeared as they all, except Bidloo indeed, deſcribe them, in different ſubjects: they are ſcarce alike, in all reſpects, in any two bodies: uſually there are only two of them, the ſuperior and poſterior, already deſcribed; but theſe often differ extremely in their figure. Their uſe ſeems to be, to give a tenſion or relaxation to the external ear, according as is neceſſary for the different degrees of ſounds.

* Tractat. de Auditu.

† Anat. T. 12. fig. 1.

‡ Tractat. de Auditu.

§ Myotomia nova, p. 29.

‖ De Aure human.

¶ Traitte de l' Oreille; in which alſo the Paris Cenſor greatly commends Vieuſſens's figures.

** Obſervat. Anatom.

The muſcles which Valſalva gives to the tragus and antitragus, and thoſe which Santorini and Douglaſs * give to the helix, the concha, and the meatus auditorius, appear alſo, on a ſtrict examination, to be rather lineaments only of muſcles, as Galen calls them, or muſcular membranes, than real or true muſcles; for there are very rarely any fleſhy fibres obſerved in thoſe parts, nor are there any motions there that ſhould render muſcles neceſſary.

318. The muſcles of the internal ear are of two kinds; thoſe of the malleus, and thoſe of the ſtapes: they are all extremely minute.

The muſcles of the malleus, according to Cowper, Douglaſs, and Valſalva, are three †. They are alſo found pretty conſtantly ſo, on careful diſſections. They are diſtinguiſhed by the names of the externus, obliquus, and internus.

The externus mallei, or external muſcle of the malleus, riſes with a ſhort belly from the upper edge of the meatus auditorius; and is continued, by a ſlender tendon, over the ſuperior part of the membrana tympani into the tympanum: and is, finally, inſerted into the thicker proceſs of the malleus: it ſerves to draw the manubrium of the

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* Myograph. p. 29.

† Myotom. nov. fol. p. 33. and T. 23. Du Verney makes them only two; but he deſcribès them under different names. But Vieuſſens, in his Traite de l' Oreille, makes only one muſcle of the malleus, which he calls the monogaſtrick; tho' he ſays it has a double origin, and a double extremity. He figures it T. 2. fig. 3. Valſalva, in his Treatiſe on the Ear, not only gives other names to theſe muſcles, but he deſcribes them otherwiſe; nor does he agree with Cowper as to their uſes. Boerhaave, in his Inſtitutes, differs alſo from them both. And from theſe difficulties it is not eaſy to extricate one's ſelf, as the parts are ſo minute and variable perhaps in themſelves.

malleus outward, and by that means relaxes the membrane of the tympanum.

The obliquus, called alſo by ſome the ſemicircularis, is ſituated in the external and boney part of the ductus Euſtachii; from whence paſſing a little upwards, and backwards thro' the canal, it is inſerted into the longeſt proceſs of the malleus, and ſerves to relax or ſtraiten, in various degrees, the membrane of the tympanum.

The internus mallei ariſes from the cartilaginous part, where the boney part of the ductus Euſtachii terminates; and it goes on in the boney part of this canal, in its upper part, almoſt to the feneſtra ovalis in the tympanum; where its tendon, as if it ran over a pulley, is reflected to the malleus, and is inſerted into the poſterior part of its handle, near its head. It ſerves to extend the tympanum.

The ſtapes has but one muſcle: this riſes in the canal of the os petroſum, almoſt at the bottom of the tympanum, with a tolerably thick body, which ſoon ſends out a tendon that is ſlender, and is inſerted into the head of the ſtapes and the bone called os orbicularis. It ſerves to elevate the ſtapes.

CHAP. V.

Of the muſcles of the lips and noſe.

319. THE muſcles of the lips appear, on a careful examination, to be fourteen*. They ſerve to form the various motions of the lips, and anſwer the purpoſes of the ſoul there.

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* Santorini makes them more numerous.

The conſtrictor is ſingle: it is alſo called the orbicularis. It conſtitutes the very ſubſtance of the lips. Its fibres are frequently of an arched figure [*].

The abductores are two pair; the zygomatick and buccinators. The zygomatick has its origin from the os zygomatis, whence its name: its termination is at the angle of the lips. This, tho' uſually ſingle, is ſometimes double throughout; at other times it has a double head: ſometimes its tail only is bifid, and it is variouſly interwoven with the adjoining ones.

The origin of the buccinator is partly from the anterior and lower part of the coronoide proceſs of the lower jaw [*], and partly about the roots of the poſterior dentes molares of both jaws. Its progreſs, as the head is held erect, is nearly horizontal; its termination, as that of the former. Its uſes are to bring the food into the way of the teeth, and the ſalival duct of Steno perforates it about the middle.

The elevatores are ſome of them common to both lips, ſome peculiar to each. The common ones are only one pair, called the par caninum: theſe ariſe from the hollow on each ſide, under the os jugalis, in the os maxillare, and are inſerted into the angle of the lips.

Thoſe peculiar to the ſeparate lips are two pair, the inciſorii and elevatores. The inciſorius is peculiar to the upper lip: its origin is from the maxillary bone, juſt under the orbit: it paſſes the ala of the noſe next it, and gives ſome fibres to it; and is inſerted into the orbicularis, near the dentes inciſores.

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[*] See Cant. T. 1. and Santorini, T. 1.

[†] Santorini denies this; but experience confirms it.

The elevator is proper to the lower lip. Cowper calls it elevator labii inferioris. It riſes below the dentes inciſores of the lower jaw, under the gums, and deſcends into the cutis of the chin: hence it may be properly enough called the inciſorius inferior, as the other is the inciſorius ſuperior.

The depreſſors of the lips are three: they are often wonderfully interwoven with ſome of the beforementioned muſcles. They are the triangulares and quadratus.

The triangulares are two: they ariſe each from the lateral and under-part of the lower jaw, about the middle; from whence they aſcend obliquely to the angle of the orbicularis.

The quadratus is ſingle: it is compoſed of reticulated fibres; and ariſes, with a broad beginning, from the anterior part of the ſame jaw, and terminates on the whole lower part of the orbicularis.

320. The muſcles of the noſe are three pair*; two of them dilatatores, and one conſtrictor.

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* Santorini gives a great many more muſcles than are here deſcribed, to the noſe, the lips, and other parts of the face, many of which he has the honour of being the firſt obſerver of; particularly he has given eight pair to the noſe, all which he has figured in his firſt plate: but, in diſſections, very few of theſe new muſcles are to be diſcovered. What are here deſcribed are, in a great meaſure, certain: ſuch of his as are additional, are often all wanting: ſometimes one or two of them, indeed, are found; but they ſeem rather the ſportings of nature than real and determinate conformations: they often have neither the appearance of the fibres or membranes of muſcles. We are to add to this, that Cowper, Morgagni, and Cant affirm, with great juſtice, that the muſcles of the face are ſo various, in different ſubjects, that, after diſſecting a hundred faces, no two of them will be found perfectly alike in this reſpect; and to this only is it to be attributed, that ſo great and accurate men as Cowper, Euſtachius,

The dilatatores, which ſerve alſo to elevate the noſe, are very various in different ſubjects; but, in general, they are however two on each ſide; tho', even in this, they vary extremely, and ſometimes are ſo thin and fine as ſcarce to be perceptible. They are called the pyramidalis and myrtiformis.

The pyramidalis ariſes from the root of the noſe, and is uſually continuous with the frontalis: it deſcends along the ſide of the noſe, where it is by degrees a little expanded. It is inſerted into the alæ of the noſe, and often ſends down its fibres as far as to the upper lip *.

The myrtiformis, or dilatator, ſtrictly ſo called, ariſes near the inciſorius of the upper lip, of which it frequently is but a part: it is inſerted partly in the alæ of the noſe, and partly in the upper lip.

The conſtrictor is but one: it is not orbicular in human ſubjects, as it is in many of the quadrupeds; but is only a ſmall muſcle, firſt deſcribed by Cowper †. Properly there is, in the human frame, no ſuch muſcle as the conſtrictor orbicularis of beaſts; but this ſerves in ſome degree in its office.

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chius, Cheſelden, and Santorini, differ ſo greatly in their deſcriptions of the parts. This difference is evidently owing to the variety of the real ſtructure in the ſeveral faces they had examined; and upon the whole it is very fairly to be concluded, that little is to be ſaid with certainty; except of thoſe mentioned in our enumeration. What we call *luſus*, or ſportings of nature, tho' they are the ſource of confuſion in theſe examinations, are not without their uſe, and that of the moſt important kind: it is to them that the variety of human faces is in a great meaſure owing. Santorini acknowledges, that ſeveral of his new ones were only to be found in robuſt ſubjects. Our author acknowledges, that tho' he had ſought for them in ſuch, there were many of them which he could never find as real muſcles.

* See Drake's 17th Table; and Cowper, in fol. T. 25.

† See Myotom. in 8vo.

office. It is alſo figured by Euſtachius [‡]. It ariſes above the dentes inciſores of the upper jaw, and terminates in the alæ of the noſe. Santorini will have it, that it is double [§], which has been alſo ſometimes ſeen. The orbicularis of the lips aſſiſts this very greatly in its action.

CHAP. VI.

Of the muſcles of the lower jaw.

321. THE muſcles of the lower jaw are ſix pair, two of depreſſors, and four of elevators. The depreſſors of the lower jaw are, firſt, the platyſma myoides; 2dly, the biventer.

The platyſma myoides ariſes near the clavicle, from the pectoral and deltoide muſcles; and alſo, as Galen, and after him Cowper, have obſerved, from the vertebræ of the neck, and is inſerted into the lower jaw; but that in ſuch a manner, that it uſually ſends out, in its courſe, fibres to the cheeks and lips, and uſually alſo to the ears; to the motions of all which parts it is alſo aſſiſtant.

The biventer, called alſo, from the Greek, the digaſtrick, or two-bellied muſcle, has its origin in the inciſure that is under the maſtoide proceſs. The tendon of it often paſſes alſo the ſtylo-hyoidæus muſcle, and the membranaceous ring affixed to the os hyoides, in the manner of a pulley; and is then inſerted, by ſynchondroſis, into the internal part of the chin. The mouth is opened, by means of this trochlea, in a moſt wonderful and elegant manner [‖].

[‡] Tab. 41. fig. 1.

[§] Obſ. Anatom. p. 21.

[‖] See our author's Diſſertatio de Maſticatione.

The four pair of elevatores are, the crotaphites, the maſſeters, and the internal and external pterygoidæi.

The crotaphites, called alſo the temporal muſcle, has its origin in the whole region of the temples, but more particularly in the oſſa frontis, ſincipitis, temporum, and ſphenoides. It paſſes under the jugum, and is inſerted into the acute proceſs of the jaw.

The maſſeter has its origin from the lower and interior part of the jugum, and its end at the external ſuperficies of the angle of the jaw. The ductus Stenonianus, or ſalival duct of Steno, paſſes over this muſcle.

The pterygoidæus internus, or internal pterygoide muſcle, has its origin in the cavity of the pterygoide proceſs, and its termination in the interior and lower ſuperficies of the angle of the jaw.

The pterygoidæus externus has its origin from the exterior lamina of the juſt mentioned proceſs, and the neighbouring part of the ſpheroidal bone; and its termination is a little above the inſertion of the other *.

CHAP. VII.

Of the muſcles of the os hyoides and tongue.

322. THE muſcles of the os hyoides are five pair; the mylo-hyoides, the coraco-hyoides, the genio-hyoides, the ſterno-hyoides, and the ſtylo-hyoides.

The mylo-hyoides ariſes, with a large baſe, from the bottom of the lower jaw, near the chin; and its termination is at the baſe of the os hyoides.

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* See Cowper's Myotom. nov. fol. T: 31.

The coraco-hyoides has its origin behind the coracoide proceſs, from the upper coſta of the ſcapula. Cowper and Morgagni have accurately figured it; and it is inſerted into the baſis, and the horn of the os hyoides.

The genio-hyoides ariſes in the middle of the chin, above the mylo-hyoides, and near the ſynchondroſis of the jaw: its termination is in the baſe of the os hyoides.

The ſterno-hyoides ariſes from the ſternum and clavicle uſually; ſometimes only from the ſternum, and ſometimes only from the clavicle: it is inſerted into the baſe of the os hyoides, and is the antagoniſt to the former.

The ſtylo-hyoides has its origin in the ſtyloide proceſs, and its termination in the horn and the baſe: this is often perforated by the digaſtrick muſcle of the jaw.

The uſes of theſe ſeveral muſcles will be eaſily underſtood from their ſituation. Cowper has excellent figures of them in his 27th Plate.

323. The muſcles of the tongue are four pair, the genio-gloſſi, ſtylo-gloſſi, cerato-gloſſi, and the baſio-gloſſi.

The genio-gloſſus has its origin in the chin, above the genio-hyoidæus: it enters the middle of the tongue, and moves it forward.

The ſtylo-gloſſus ariſes from the apex of the ſtyloide proceſs: it deſcends obliquely to the ſide and root of the tongue, and moves it ſideways backwards and upwards.

The cerato-gloſſus ariſes from the horn of the os hyoides, and is inſerted into the root of the tongue.

The baſio-gloſſus ariſes from the baſe of the os hyoides, and runs along the middle of the tongue toward its apex: it, with the aſſiſtance of the precedent, draws the tongue backward, and makes it ſhorter.

Some authors add to theſe the name of a muſcle called mylo-gloſſus; but what they call by this name is only a part of the mylo-hyoidæus, and there is therefore no neceſſity to increaſe the number of the muſcles by making one of it.

CHAP. VIII.

Of the muſcles of the larynx, epiglottis, and pharynx.

324. THE muſcles of the larynx are generally accounted ſeven pair. They have their names from the places of their origin and inſertion; and the principal uſe of all of them is to aſſiſt in modulating the voice *.

Of theſe ſeven pair two are common, and have their origin out of the larynx: the other five are proper, and have both their origin and termination in the larynx. The common ones are the ſterno-thyroides, and the hyo-thyroides.

The ſterno-thyroides draws the larynx downward, and at the ſame time dilates the glottis †.

The hyo-thyroides elevates the larynx, and conſtringes the glottis ‡.

The five proper muſcles of the larynx, ariſing and terminating in it, are,

1. The crico-thyroides, which ſerves occaſionally either to dilate or conſtringe it §.

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* Santorini deſcribes ſeveral others, and has figured them in his third Plate: he acknowledges, however, that they are only to be found in ſome particular ſubjects; and our author acknowledges he never was able to find them at all.

† See Cowper's Myol. nov. p. 45.

‡ See Santorini, p. 103.

§ See the ſame, p. 102.

2. The crico-arytænoides poſticum; and, 3. The lateral crico-arytænoides, which ſerve to dilate the glottis.

4. The thyro arytænoides, which, together with the following, ſerves to conſtringe it.

5. The ary arytænoides: this laſt ariſes frequently from one arytænoide cartilage, and is inſerted into the other: this and the former mutually interſect one another, and ſtraiten the glottis *. Often there is only one muſcle †, and often it is different from what is here deſcribed; for nature varies greatly in it ‡.

Anatomiſts, for a long time, allowed the muſcles of the epiglottis only to brutes §, tho' Sylvius had deſcribed very punctually two attollents, and as many depriments, in human ſubjects ‖; but of late they have been reſtored to the human frame again. One of the firſt who has allowed them there is J. G. Paul ¶, who declares that himſelf had found them; and, after him, they were deſcribed by ſeveral others.

The attolents are two: they are conſiderably long, and are extended from the baſe of the os hyoides to the hinder root of the epiglottis: theſe the author calls hyo-epiglottei.

The depriments are two, and ſmaller: they extend, from the apices of the arytænoide cartilages, obliquely forwards to the ſides of the epiglottis: they are called ary-epiglottei **.

325.

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[*] See Morgagni's Adverſar. T. 1. fig. 2.

[†] See Cowper, p 46.

[‡] See Morgagni's Adverſ. 1. and Santorini, p. 104.

[§] See Fabricius ab Aquapendente, and Caſſerius de vocis organ.

[‖] See his Iſagoge Anat. cap 7. de Muſculis.

[¶] In his Preface to the Opuſcula of Horn

[**] Monſ. Littre, in the Memoirs of the French Academy for the year 1718, deſcribes three muſcles of the epiglottis, two

325. The muſcles of the pharynx * ſerve partly to dilate, and partly to contract it. Of thoſe which dilate it, there are ſix pair: there is only one to contract it.

The ſix which ſerve to dilate it are,

1. The ſtylo-pharyngæus. This ariſes from the beginning of the ſtyloide proceſs, and is inſerted on both ſides into this and into the thyroide proceſs. This and the following pair ſerve as well to elevate as to dilate the pharynx.

2. The cephalo-pharyngæus. This riſes from the anterior apophyſis of the occipital bone, and terminates in its poſterior part †.

3. The ptery-pharyngæus, which ariſes from the pterygoide proceſſes ‡.

4. The ſalpingo-pharyngæus, which ariſes from the Euſtachian tube §.

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two of them depriments, and one attollent; but he is not punctual as to their origin, inſertion, and other particulars. Santorini alſo deſcribes not only one attollent, (ſomething of which our author diſcovered afterwards, and which is figured according to that obſervation in the eighth plate of this work, fig. 34, letter k) but alſo four depreſſors, two ary-epiglottidæi, and two larger thyro-epiglottidæi; and even, beſide theſe, he mentions two ſmaller thyro-epiglottidæi in the middle part of the epiglottis: but theſe himſelf confeſſes are ſo extremely thin and delicate, eſpecially the laſt pair, that they are ſcarce perceptible, unleſs in ſubjects of the moſt robuſt make. Our author alſo declares, that he never in any diſſection met with any thing more than membranes in the place of them: it does not, however, follow from this, that in ſome they may not be larger and more diſtinct. See Santorini, cap. 6. and Morgagni's Adverſ. 1. N. 28.

* See Cant's figures, T. 3. and Cowper's Myotom. T. 28 and 29.

† See the ſame; as alſo Douglaſs's Myograph. 41. Santorini calls this pair azygos, p. 121. Valſalva denies this origination of them; but all theſe authors join in aſſerting it, and our author's experience confirmed it.

‡ Morgagni's Adverſar. 1. p. 4.

§ See Douglaſs, Cant, and Santorini.

5. The mylo-pharyngæus, which ariſes from the lower jaw, behind the laſt of the dentes molares, and ſurrounds in great part the tonſils *.

6. The gloſſo-pharyngæus, which ariſes from the tongue. This, as well as all the others, terminates in the poſterior parts of the tongue, where a tendinous line is often very conſpicuous †.

The ſingle muſcle, which ſerves for the conſtriction of the pharynx, is the œſophagæus, or, as it is otherwiſe called, the ſphincter gulæ. This riſes on each ſide from the os hyoides and the thyroide, and the cricoide of the larynx, and ſurrounds the hinder part of the gulæ. Valſalva, on occaſion of the multiple origin of theſe muſcles, has divided them into three pair; and Douglaſs, Cant, and Santorini have made yet more of them, and have given names to their diviſions of them, from their origin and termination; as hyo pharyngæus, thyro-pharyngæus, and crico-pharyngæus: but as the fibres of all theſe are, in reality, very intimately connected and interwoven together, ſo that they very rarely can be explicated, and ſcarce ever in any thing like the regularity and order Valſalva and others have deſcribed, it ſeems beſt to agree with Cowper not to multiply parts without reaſon, and to account all theſe as ſo many parts only of one whole, which is the muſcle, called by the other writers the œſophagæus, or the ſphincter gulæ.

The muſcle called by Cowper vaginalis gulæ, has been already deſcribed in what appears to be its proper place, under the name of tunica muſculoſa œſophagi. See Section 260.

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* Santorini thought this had not been deſcribed; but Cowper has a fine figure of it.

† Some deny the exiſtence of this line; and it ſometimes indeed is wanting.

CHAP. IX.

Of the muſcles of the Uvula.

326. THE muſcles of the uvula, which, together with the velum palatinum already deſcribed, is a part of the pharynx, are ſix pairs, and one ſingle one. Theſe are,

1. The gloſſo-ſtaphylinus [*], or gloſſo-palatinus, ariſing on each ſide from the root of the tongue, and terminating in the velum palatinum.

2. The pharyngo-ſtaphylinus, which riſes on each ſide from the ſides of the pharynx, and terminates alſo in the velum [†].

3. The thyro-ſtaphylinus, which ariſes from the lateral part of the thyroide cartilage, and, aſcending towards the uva, becomes larger; and is inſerted, in manner of an arch, in the ſide of the velum palatinum.

4. The ſpheno-ſtaphylinus of Cowper, Cant, and others, tho' it might be more properly called the ſalpingo ſtaphylinus [‡], as the moſt accurate examinations prove that it has not its origin, or, at the utmoſt, but in a very ſmall part, from the os ſphenoides; but principally from the poſterior part of the tube, and indeed partly from its membranaceous part [§]: it deſcends from hence obliquely to the uva, and is inſerted into its hinder and upper part; and hence, if both theſe act together, they retract or draw it back [‖].

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[*] Valſalva de Aure hum. c. 2.

[†] Ibid.

[‡] Valſalva, c. 2.

[§] Poſſibly however this origin ſometimes varies, as it does in many others.

[‖] See Cowper, T. 28. fig. 4. and our T. 8. fig. 38.

5. The pterygo-ſtaphylinus*: this ariſes from the upper part of the pterygoide proceſs, and the anterior part of the tube, which is near it: it deſcends between its two lamellæ, and turns back its tendon over the thin apophyſis of the interior lamella, as if over a trochlea, to the anterior part of the membrane of the palate, into which it is inſerted†: the uvula is therefore moved downwards and forwards by this pair. Valſalva calls this muſculus novus tubæ, tho' it had been deſcribed long before his time: he ſuppoſes that its office is to dilate the tube; but of this more hereafter‡.

6. The palato-ſtaphylinus ariſes on each ſide from the junction of the bones of the palate: it is broad at its beginning, but it afterwards joins its aſſociate, and becomes then narrower, ſo as to reſemble a triangle, which deſcends from the place of its origin to the uvula, and is inſerted into its upper part: it draws it upward and forward§.

7. The muſculus azygos of Morgagni‖: this riſes tendinous from the juncture of the bones of the palate, and is extended fleſhy, thin, and cylindrick along the middle of the uvula¶. It is placed at the back of the former muſcle, and, with the glandules and the membrane of the mouth, conſtitutes the uvula**.

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* See Cowper, T. 28.

† See Cant, T. 3. fig. 2. and T. 8. fig. 38. of this work.

‡ See his Tract de Aure.

§ Douglaſs, in his Myographia, claims the honour of diſcovering this before: the names, indeed, are Douglaſs's.

‖ See Morgagni's Adverſ. I. n. 8.

¶ See Cant, l. c. and our T. 3. fig. 38.

** See Santorini, c. 7.

CHAP.

CHAP. X.

Of the muſcles of the head and neck.

327. THE muſcles of the head are ten pair. Three pair of them are called flexors *, and are,

1. The maſtoidæus: this riſes from the ſternum and clavicle, and terminates in the external ſurface of the maſtoide proceſs.

2. The rectus major anticus: this ariſes from the tranſverſe apophyſes of the five lower vertebræ of the neck; and is inſerted into the os occipitis, before the condyloide proceſs.

3. The rectus minor anticus, called by Cowper muſculus annuens †: this ariſes from the anterior ſurface of the atlas, or firſt vertebra of the neck; and lies concealed, as it were, under the former, 'till it is at length inſerted, a little behind it, into the os occipitis.

The extenſors of the head, beſide thoſe common to the neck, are five pair:

1. The ſplenius: this riſes from the lower vertebra of the neck and the five upper ones of the back, and is inſerted a little above the maſtoide proceſs.

2. The complexus: this has its origin from the three upper vertebræ of the back, and the ſix lower ones of the neck: it runs under the former, and is inſerted near it into the os occipitis.

3. The rectus major poſticus: this has its origin from the ſpinoſe apophyſis of the epiſtrophæus, and is inſerted into the os occipitis.

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* Winſlow obſerves, in the Paris Memoirs for the year 1720, that theſe not only greatly aſſiſt the bending of the head; but ſometimes, when we are erect, and the reſt of the muſcles quiet, the firſt will do it alone.

† See Cowper's Myol. T. 24.

4. The rectus minor poſticus: this has its riſe from the poſterior part of the atlas, and its end under the former.

5. The obliquus minor: this has its origin from the tranſverſe apophyſis of the atlas, and its termination a little above that of the rectus major.

The rotatory muſcles of the head are only one pair: this is the obliquus major: its origin is in the ſpinoſe apophyſis of the epiſtrophæus, or ſecond vertebra; and, aſcending obliquely from thence, it is inſerted into the tranſverſe apophyſis of the atlas *.

The muſcles bending the head ſideways, are only one pair. This is the rectus lateralis †: this has its origin from the upper ſurface of the tranſverſe apophyſis of the atlas: from this it aſcends ſtrait, with a ſhort body, but conſiderably thick; and is inſerted partly into the os occipitis, and partly into the temporal bone, near the inciſure of the maſtoide proceſs.

328. The muſcles of the neck are ſix pair: two pair are flexors, two are extenſors, and two ſerve to draw the part ſideways. The flexors are,

1. The ſcalenus: this has its origin from the firſt, the ſecond, and ſometimes the third rib; and is inſerted into the tranverſe apophyſes of the vertebræ of the neck. This muſcle is referred by Fallopius, and ſome others, to the number of the elevators of the thorax, and that not without ſame reaſon; for it ſerves both to that purpoſe, and to that for which it has its place here. This muſcle is frequently divided into three parts,

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* This is not properly a muſcle of the head; for it does not touch any part of it. It is truly a muſcle of the atlas: it has its origin from the ſecond vertebra, and is inſerted into the firſt.

† See Cowper, l. c. k.

ſometimes more, ſometimes leſs diſtinctly: from hence ſome of the anatomical writers have made three muſcles of it, under the name of the firſt, the ſecond, and the third ſcalenus.

2. The longus: this ariſes from the bodies of the five upper vertebræ of the back, and is inſerted into all the vertebræ of the neck.

The extenſors of the neck are the tranſverſales and interſpinales:

1. The tranſverſal, called alſo the ſpinal muſcle*: it is owing to Cowper † that this pair of muſcles is added to the extenſors of the neck; nor muſt we omit the mentioning and enumerating them among theſe; but they are very improperly ſeparated from the common extenſor of the back and loins, called longiſſimus dorſi, of which they are truly no more than a part: but of this more hereafter.

2. The interſpinales colli: theſe are truly five pair, and are ſituated between the ſpinoſe apophyſes: they ariſe from the upper part of the ſpinoſe apophyſes of the five lower vertebræ of the neck, and each of them is inſerted into the lower part of the ſpinoſe apophyſis of the vertebra next above.

Of the muſcles of the neck, ſerving to bend it to one ſide, are the intertranſverſales and intervertebrales:

1. The intertranſverſales are ſituated among the tranſverſe apophyſes of the vertebræ: they ariſe from the lower vertebra, and are inſerted into that next above ‡.

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* See Cowper's Myotom. fig. 8. i. and k.

† See Cowper's Myotom. nov. T. 44.

‡ See Philoſ. Tranſact. vol. 21. p. 132.

2. The intervertebrales Douglaſſi *, ſo called from their diſcoverer Dr. Douglaſs, are very ſmall, and their number uncertain: they ariſe from the lateral part of the body of the vertebra, and aſcend obliquely to the poſterior part of the vertebra next above.

CHAP. XI.

Of the muſcles of the ſcapula.

329. THE muſcles of the ſcapula are properly five pair:

1. The elevator, or, as it is called by ſome, muſculus patientiæ: this ariſes from the tranſverſe apophyſes of the firſt, ſecond, third, and fourth vertebra of the neck, and terminates at the ſuperior angle of the ſcapula.

2. The trapezius, or cucullaris: its origin is from the os occipitis, the ſpinoſe apophyſes of the neck, and of the ſeventh and eighth of the back †. Its termination is at the ſpine of the ſcapula, the acromion, and clavicle. This has the power of ſeveral very different motions: the different courſe of its ſeveral fibres enabling it, as they act differently, to move the ſcapula upwards, downwards, or backwards ‡.

3. The rhomboides: this has its origin from the five lower ſpinoſe apophyſes of the neck, and the three upper ones of the back, under the precedent muſcle: it runs obliquely under it, and

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* See his Myograph. p. 85.

† Douglaſs extends the originations of theſe even to the tenth vertebra. Myogr. p. 69.

‡ Cheſelden denies theſe diverſity of actions, and ſays this muſcle only ſerves to draw the ſcapulæ backward, or toward one another. Winſlow is againſt this, and ſays their principal uſe is to elevate the ſcapula. Mem. Paris 1719.

is inſerted into the whole baſe of the ſcapula. It ſerves to move it upwards and backwards.

4. The ſerratus, or dentatus minor anticus, called alſo the pectoralis minor: this ariſes, by dentated origins, from the ſecond, third, and fourth true ribs: it continues its courſe under the pectoralis magnus, and is inſerted into the coracoide proceſs of the ſcapula.

5. The ſerratus, or dentatus major anticus: this ariſes alſo by dentated origins from the ſix lower true ribs, and from one, or ſometimes two of the upper ſpurious ones *; and it terminates in the baſe of the ſcapula. Theſe two ſerve to move the ſcapula forward and downard: many of the anatomical writers have referred theſe to the number of the elevators of the ribs. Theſe call that the beginning of the muſcle which we here call its end †. It is to be allowed, that they may alſo ſerve to the purpoſe which thoſe authors ſuppoſe them intended for, when the ſcapula is held firm and immoveable by the elevator, trapezius, and rhomboides.

CHAP. XII.

Of the muſcles ſerving to reſpiration.

330. OF the muſcles ſerving to reſpiration, ſome of them dilate the thorax, and others contract it. The dilators act conjunctly: they are,

1. The diaphragm, which has been already treated of in its place, (S. 257.)

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* The two or three lower dentated beginnings of theſe muſcles join thoſe of the external obliqui of the abdomen.

† See Douglaſs's Myograph. p. 73, and 74.

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2. The intercoſtals, which are generally allowed to be forty-four in number: in every interſtice of the ribs there are two, an internal, and an external. Their origin is from the lower edge of the ſuperior rib, and their termination at the upper edge of the ſucceeding rib: the fibres of the external ones run forward, and thoſe of the internal ones obliquely backward. They ſerve to elevate the ribs for the ſervice of the lungs.

3. The levatores coſtarum of Steno, and ſupracoſtales of Verheyen*, are of two kinds, diſtinguiſhed, from their figure, into ſhort and long.

The ſhort ones, breves, are twelve on each ſide: they have their origin from the tranſverſe proceſſes of eleven vertebræ of the back, and of one that is the lower one of the neck; and they are inſerted obliquely into the hinder part of the ribs.

The long ones, longi, are three or four: their origin is the ſame, from the ſeventh, eighth, ninth, and tenth verbræ; and their end in the ninth, tenth, eleventh, and twelfth ribs †.

4. The ſubclavian: this riſes from the lower part of the clavicle, near the acromion; and terminates in the anterior part of the upper rib, and of the ſternum.

5. The ſerratus poſticus ſuperior: this ariſes, with a thin and broad tendon, from the two lower vertebræ of the neck, and the two upper ones of the back; and terminates in the ſecond, the third, and the fourth ribs ‡.

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* See Anatom. T. 35. fig. 1. e e, f f. Morgagni, in his Adverſ. 2. 36. ſhews that theſe muſcles were well known to Caſſerius and Steno.

† See Verheyen, ibid. fig. 1, f f.

‡ Poſſibly this muſcle ſerves alſo to extend the neck, and ſerves the muſcles of the neck and back in place of a ligament.

6. The ſerratus major anticus, mentioned under our laſt diviſion among the muſcles of the ſcapula, is alſo by moſt authors referred to this place; but as the ſcapula is evidently a part ſuſceptible of more and eaſier motions than the ribs, it is evidently more properly to be numbered among its muſcles. It is to be allowed, indeed, that this muſcle ſometimes may aſſiſt in raiſing the ribs, eſpecially in caſes of difficult reſpiration.

7. The ſcalenus colli, of which we have already treated among the muſcles of the neck, which is certainly its more proper place.

The conſtrictors or depreſſors, beſide the muſcles, more properly belonging to the abdomen, tho' aſſiſting in this effect, are theſe:

1. The ſerratus poſticus inferior: this riſes with a broad tendon from the three lower vertebræ of the back, and the two upper ones of the loins: it terminates in the four inferior ſpurious ribs, and ſurrounds the extenſors of the back, in manner of a vagina, to prevent their fibres from ſeparating one from another, as they might otherwiſe do in violent motions.

2. The triangularis ſterni: this riſes from the lower and interior part of the ſternum, and is inſerted on each ſide into the cartilages of the fourth, fifth, ſixth, and ſeventh true ribs. Verheyen divides this into ſeveral muſcles, and calls them ſterno-coſtales *. Some authors alſo deny its exiſtence; but this is a very raſh determination, and has no foundation in obſervation.

3. The intercoſtales of Verheyen. Of theſe there are found, on drawing away the pleura, ſix, ſeven, eight or nine on each ſide: they have their origin not far from the heads of the ribs, and, aſcending obliquely, terminate in a rib above,

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* L. c. fig. 2. a b c d e.

ſome in that immediately over the other, ſome in the next but one above *. Morgagni obſerves †, that theſe muſcles were known to Euſtachius.

4. The extenſor lumborum & dorſi communis, to be deſcribed more at large in the next ſection, concurs alſo to the depreſſing the ribs on this occaſion. It has its origin from the os ſacrum, and is inſerted by a multiple tendon into the hinder part of the ribs ‡. Morgagni alſo goes ſo far as to aſcribe tendons to this muſcle, by means of which it acts, he ſays, as an elevator of the ribs.

CHAP. XIII.

Of the muſcles of the back and loins.

331. THE muſcles of the back and loins are for the moſt part common: there are of the extenſors uſually reckoned three on each ſide.

1. The ſacro-lumbaris: this has its origin at the os ſacrum and poſterior ſpine of the ileum, and its termination in the upper part of the ribs.

2. The longiſſimus dorſi, which has its origin in the ſame place, and its termination partly in all the vertebræ of the ſpina dorſi, particularly in their tranſverſe apophyſes, and partly in the ribs ‖.

3. The ſemi-ſpinoſus: this has its origin from the os ſacrum and vertebræ of the loins, and its termination at the upper vertebræ of the thorax, eſpecially at their ſpinoſe apophyſes.

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* Ibid. fig. 3. d d, e e.

† Adverſ. Anat. 2. p. 36. and Tab. Euſtach. 16.

‡ See Verheyen, fig. 1. b b.

§ See Adverſar. Anat. 2. p. 38.

‖ See Morgagni's Adverſ. 2. p. 38.

Theſe are the three muſcles uſually allowed as extenſors in this part; but as they cohere in ſo firm a manner together, that they are ſcarce to be ſeparated by any act without laceration, and as they all conſpire in the performing the ſame action, perhaps it is more juſt to call them all together only one common muſcle, under the name of the common extenſor of the back and loins *. If theſe act only on one ſide, they draw the back obliquely ſideways.

The flexors, beſide the muſcles of the abdomen, which ſerve to the drawing the parts as well forwards as ſideways, are,

1. The quadratus lumborum: this has its origin in the anterior and ſuperior part of the poſterior proceſs of the os ilei, and its end at the tranſverſe apophyſes of the vertebræ of the loins, the laſt vertebra of the thorax, and the laſt rib.

2. The pſoas parvus: this ariſes by a ſlender tendon from the os pubis, where it is joined to the ileum; and is inſerted into the ſide of the upper vertebra of the loins †.

3. The intertranſverſales lumborum: theſe are very ſmall muſcles, deſcribed by Douglaſs: they are ſituated between the tranſverſe apophyſes of the loins, ariſing from the rim or edge of one; and, being inſerted into the ſucceeding one, they aſſiſt in the moving the part ſideways ‡.

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* Cheſelden in his Anatomy obſerves, that theſe muſcles act alſo alternately when we are walking, elevating the oſſa innominata; and that this may be perceived, on laying a hand upon the loins as we walk.

† This muſcle is often wanting: when it is found, its office is to aſſiſt the quadratus in elevating the oſſa innominata, eſpecially when we lie down. Douglaſs ſays Riolan was the firſt who deſcribed it, p. 90.

‡ See Douglaſs's Myogr. p. 90.

CHAP.

CHAP. XIV.

Of the muſcles of the arm and hand.

332. THE muſcles of the arm, the brachius or humerus, are nine. The elevatores are three *.

1. The deltoides: this ariſes from the clavicle, and the acromion and ſpine of the ſcapula; and terminates at four fingers breadth below the neck of the humerus.

2. The ſupraſpinatus: this has its origin from a cavity above the ſpine of the ſcapula, and its inſertion in the neck of the humerus.

3. The coraco-brachialis: this has its origin at the coracoide proceſs of the ſcapula, and its termination about the middle part of the arm.

The depreſſors of the arm are three: theſe are aſſiſted in their action by the weight of the arm itſelf. They are,

1. The infra-ſcapularis: this has its origin from the whole internal ſurface of the ſcapula, and its termination in the interior part of the head of the humerus.

2. The rotundus, or teres major: this has its origin at the lower angle of the ſcapula, and its termination three fingers below the head of the humerus.

3. The latiſſimus dorſi, called alſo by ſome aniſcalptor: this has its origin at the poſterior part of the ſpina ilei, the upper ſpine of the os ſacrum, and all the ſpinoſe apophyſes of the loins, and the ſeven inferior ones of the back: it unites its ten-

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* Winſlow, in the Paris Memoirs, ſhews that the adductores and abductores aſſiſt theſe.

don with the former muſcle, and is inſerted in the ſame place.

The adductores are only one pair, the pectoralis major: this has its origin in the clavicle, the ſternum, and all the true ribs, and its termination at four fingers breadth below the head of the humerus. The action of this muſcle is probably greatly aſſiſted by the action of the coraco-brachialis, and that of the deltoides by that of the upper part of this pectoral muſcle, which is uſually a kind of diſtinct muſcle.

The abductores of the arm are two, the infra-ſpinatus, and the rotundus, or teres minor:

1. The infra-ſpinatus has its origin in the cavity below the ſpine of the ſcapula.

2. The rotundus, or teres minor, has its origin at the inferior coſta of the ſcapula; and this, with the former, indeed, properly form only one conjunct muſcle, forming at the extremity only a ſingle tendon, which is inſerted into the poſterior part of the neck of the humerus.

333. The muſcles of the cubitus are ſix, two flexors, and three extenſors. The flexors are,

1. The brachialis externus: this riſes tendinous with two heads: one of them, which is the broader, has its origin from the coracoide proceſs; the other, which is ſlender and longer, from the acetabulum of the ſcapula. This deſcends in the channel of the humerus, under the ligament of the joint; becomes fleſhy, and joins with the former: and after this runs near the inſertion of the deltoides, in the anterior part of the arm, and ends partly by a round tendon in the tubercle of the radius, a little below its upper head; and partly by a broad tendon in the common membrane, which ſurrounds all the muſcles of the cubitus. This tendon is ſometimes

cut in bleeding, and very bad conſequences attend the accident *.

2. The brachialis internus ariſes juſt below the end of the deltoide, and is inſerted into the tubercle of the ulna, a little below its upper head.

The extenſors of the cubitus are four, the longus, brevis, brachialis externus, and anconæus.

1. The longus ariſes from the inferior coſta of the ſcapula.

2. The brevis ariſes from the external ſpine of the humerus.

3. The brachialis externus ariſes near the former, from the interior ſpine of the humerus. Theſe three unite their ſeveral tendons, and make, as it were, only one triply divided muſcle, which is inſerted into the hinder part of the olecranon, and may very properly be called the muſculus triceps brachialis.

4. The anconæus has its origin in the exterior condyle of the humerus, and its termination a little below the terminations of the others.

334. The muſcles of the radius are four; two of them are pronators, two ſupinators. The pronators are,

1. The rotundus: this riſes from the internal condyle of the humerus, and terminates near the middle of the radius.

2. The quadratus, which has its origin in the lower part of the ulna, and its termination oppoſite in the lower part of the radius.

The ſupinators are,

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* Theſe are elegantly figured by Cowper, Myotom. nov. T. 50. and deſcribed p. 74. Winſlow alſo, in the Paris Memoirs 1720, has treated judiciouſly of the ſubject: he ſhews, that this muſcle is properly a ſupinator of the radius, and an elevator of the arm.

1. The longus, which has its origin from the exterior ſpine of the humerus, and its termination at the lower head of the radius *.

2. The brevis, which riſes from the upper part of the ulna, and is inſerted into the upper part of the radius, which it totally ſurrounds and incloſes.

335. The muſcles of the carpus, or hand, are ſix: three of them are flexors, three extenſors. The three flexors all ariſe from the internal condyle of the humerus: they are,

1. The radiæus internus: this is inſerted into the bone of the carpus next the thumb.

2. The ulnaris internus, which terminates in the internal oſſicle of the carpus.

3. The palmaris, which is inſerted into the palm of the hand by a broad expanded tendon, and the office of which ſeems to be the conſtriction of the palm.

The three extenſors all ariſe from the external condyle of the humerus: they are,

1. The radiæus externus. 2. The longus & brevis, called by others the bicornis. One of theſe is inſerted into the firſt metacarpal bone, and the other into the ſecond.

3. The ulnaris externus, which terminates in the metacarpal bone that ſupports the little finger.

If the muſculi radiæi act all together, and at the ſame time the ulnares are all quiet, the hand is moved outwards: and, on the other hand, when the two ulnares act together, and the radiæi are quiet, the hand is drawn inwards. The muſcles are alſo kept together, and in their places, by a ligament, called, from its ſhape, the ligamentum annulare: but we are to obſerve, that

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* This muſcle may alſo be of uſe in the bending the cubit.

this ligament does not appear annular in diſſections, as it is uſually figured; but is rather a common membrane, ſurrounding and including all the muſcles which are placed about the cubitus and carpus, and facilitating their motions. In preparations of the parts, this membrane aſſumes an annular figure, ſuch as it is uſually repreſented of *.

336. The muſcles of the palm of the hand are two, according to the generality of anatomical writers; the palmaris, ſimply ſo called, and the palmaris brevis.

The palmaris has been deſcribed in the laſt ſection, among the flexors of the hand; to which it more properly belongs than immediately to the palm.

The palmaris brevis, called alſo by ſome caro quadrata, adheres, in form of a ſmall maſs of fleſh, to the aponeuroſis of the palmaris longus, above the abductor muſcle of the little finger: this is ſaid to aſſiſt in drawing together the hand: both this and the former, however, are often found to be wanting in diſſections.

CHAP. XV.

Of the muſcles of the fingers and toes.

337. THE muſcles of the fingers are in part common, and in part proper. The common are the flexors of the firſt, ſecond, and third phalanx, the extenſor and interoſſei.

1. The flexors of the firſt phalanx are the four lumbricales: theſe ariſe deep and tendinous, and are inſerted into the firſt phalanges on the ſide next the thumb.

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* See Veſalius's Muſcul. T. 1, and 2.

2. The flexors of the ſecond phalanx are the ſublimis, called alſo perforatus: this ariſes from the internal condyle of the humerus and the radius, and is divided into four tendons, which are inſerted into the ſecond phalanges of the four fingers.

3. The flexors of the third phalanx are the perforans, or profundus: this has its origin at the upper part of the middle of the ulna, and, dividing into four tendons as the former, it perforates the tendons of that, and is inſerted into the beginning of the third phalanx of the four fingers*.

The extenſor of all the three phalanges is called the extenſor communis: it has its origin at the external condyle of the humerus, and the poſterior part of the radius and ulna: it then divides into four tendons, which paſs under the ligament of the carpus, and terminate in the poſterior ſurface of all the phalanges of the fingers, which are gibbous on that ſurface.

The interoſſei are divided by anatomiſts into the internal and external. The external interoſſei are three: they occupy the interſtices between the bones of the metacarpus in the back of the hand. The internal ones are alſo three, according to the generality of writers; but Stockhuſius makes them ſix: they are ſituated in the palm of the hand, and are more properly placed under the bones of the metacarpus than between them; ſo that interoſſei is a bad name for theſe. They all of them ariſe from that part of the metacarpal bones which is neareſt the carpus, and are inſerted in various manners into the ſides of the fingers. Their offices are various: they ſometimes act ſingly, ſometimes in concert with the other muſcles of theſe parts: they accordingly ſerve either to draw the fingers together, or to ſeparate them from one another; to divaricate or to contract them, and to extend or bend them.

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* Theſe two muſcles paſs under the tranſverſe ligament of the carpus; and their tendons, included in a ſtrong membranaceous vagina, are joined to the bones of the fingers, to prevent their receding in the time of flexion.

338. Of the proper muſcles of the fingers, thoſe belonging to the thumb are five:

1. Its flexor, which has its origin in the middle part of the radius, and its end in the third phalanx.

2. Its extenſor, which is called alſo bicornis and tricornis: this ariſes in the poſterior and middle part of the ulna and radius, and terminates in two or three tendons in the firſt, ſecond, and third phalanx.

3. The thenar, or abductor: the origin of this is in the tranſverſe ligament that joins the bones of the carpus, and its termination in the firſt and ſecond phalanx. The two ſeſamoide bones of the thumb are uſually found lodged in the tendon of this muſcle.

4. The hypothenar: this riſes, near the precedent, from the ſame ligament, but ſomewhat more towards the palm of the hand; and it terminates in the lower head of the firſt phalanx. This muſcle is not mentioned by many authors, and, indeed, there is ſome reaſon on the ſide of eſteeming it but a part of the former.

5. The antithenar, or abductor: this riſes from the metacarpal bone of the middle finger, and is inſerted into the firſt and ſecond phalanx *.

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* We are to obſerve on this head, that there are frequently great variations in the muſcles of the thumb, as well as in thoſe of the fingers, in different ſubjects; ſo that no deſcription

339. The proper muſcles of the index or fore-finger are two, an extenſor, and an abductor:

1. The extenſor has its origin with the common extenſor of the fingers; and, indeed, there is ſome reaſon to acknowledge it but a part or portion of that muſcle.

2. The abductor has its origin in the interior bone of the metacarpus, and terminates on the inſide of the firſt phalanx*.

340. The proper muſcles of the auricularis are two:

1. The proper extenſor, which ſeems to be a part of the common extenſor, and has its origin with it.

2. The abductor, the origin of which is at the interior bone of the metacarpus, and its inſertion at the internal ſide of the firſt phalanx.

Many add to theſe two muſcles an adductor; but this properly draws the internal metacarpal bone towards the thumb ‡.

341. We are now to return from the arms to the trunk again, to examine the muſcles belonging to the abdomen; and from theſe we are to proceed to thoſe of the legs.

342. The muſcles of the abdomen, and thoſe of the clitoris, have been already deſcribed in their proper places, under S. 205, and S. 234.

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tion can be given that will ſuit all ſubjects. The extenſor of the thumb is ſometimes bicornate, ſometimes tricornate, and in ſome ſubjects there are two flexors, as Cowper obſerves, Myot. p. 216. Variations of the like kind are alſo found in the muſcles of the other fingers. See Morgagni's Adverſ. 2. 40.

* A ſeſamoide bone is ſometimes found alſo in the tendon of this muſcle.

† In this alſo is ſometimes found a ſeſamoide bone. See our plate 1. fig. 5. l. c.

‡ See Winſlow's Obſerv. Memoirs of Paris 1720.

But we have ſtill, for the buſineſs of this place, the muſcles of the teſticles, the penis, the urethra, the anus, the urinary bladder, and the vagina, to deſcribe.

CHAP. XVI.

Of the muſcles of the parts of generation.

343. THE muſcle of the teſticles is called the cremaſter or elevator: it is a thin ſeries of muſcular fibres, ariſing ſometimes from the oblique aſcendens of the abdomen, near the place where that muſcle is perforated to give paſſage to the ſpermatick veſſels. Sometimes it riſes from the tranſverſus *; and, finally, ſometimes from the ſpine of the ileum †. From either of theſe origins it proceeds, together with the proceſs of the peritonæum, to which it is firmly joined, deſcending into the ſcrotum, and there expands itſelf over the tunica vaginalis, which includes the body of the teſticle. When this muſcle is contracted, it elevates the teſticle: it is frequently ſo very thin in emaciated ſubjects, as ſcarce to be at all diſcernable.

344. The muſcles of the penis are properly only two, called erectors. Theſe ariſe on each ſide from the oſſa iſchii, between the tubercle of this bone and the beginning of the corpus cavernoſum; and each of them is inſerted into the corpus cavernoſum of its own ſide ‡.

Theſe muſcles, when they act together, preſs the veins of the back of the penis againſt the oſſa pubis, by which they prevent the reflux of blood from the penis; and conſequently when, at the ſame time, the blood flows impetuouſly into the part by the arteries, and cannot get back this way, the penis becomes erected [*]. The muſcles of the penis, deſcribed by many authors under the names of acceleratores and tranſverſi, do not ſo properly belong to the penis in general as to the urethra in particular: we ſhall, therefore, deſcribe them under the head of the muſcles of that part.

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* See Santorini's Obſervat. cap. 9. 1.

† See it delineated in Cowper's Myotom. nov. T. 17.

‡ See Cowper, T. 17 and 19.

345. The muſcles of the urethra in men are of two kinds, dilators and conſtrictors. The dilators are,

1. The tranverſi [†]: theſe ariſe from the tubercle of the os iſchium on each ſide, and are inſerted into the poſterior part of the bulb of the urethra: they are not quite determinate and certain, however, either in their origin or inſertion; and ſometimes they are wholly wanting. When they act, they dilate the urethra in its poſterior part [‡].

2. The poſterior or triangular dilatator, dilatator poſticus: this is often extremely ſmall, and ſometimes it is double [§]. It riſes from the anterior part of the ſphincter of the anus, and is inſerted into the poſterior and lower part of the acceleratores, or elſe into the lower part of the bulb of the urethra. This muſcle has been

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[*] Schelhammer will not allow the erection of the penis to be thus performed, Diſſ. 12. Cheſelden doubts it alſo; but there ſeems much reaſon in it.

[†] See Bartholin. Anat. L. 1. c. 24. Bidloo, T. 47. Cowper's Myot. Reformat. fig. 10 and 12.

[‡] Theſe muſcles, Morgagni obſerves, are often wanting; and when they are not ſo, they vary greatly in their ſituation: experience confirms the truth of this.

[§] See Morgagni's Adverſar. 4.

taken for a part of the ſphincter ani by Riolan *. He acknowledges that it is extended to the urethra; but he will have it a part of that muſcle. Littre † is the firſt who acknowledged it for a diſtinct muſcle, and deſcribed it as ſuch. This muſcle ſeems to be an antagoniſt as well to the acceleratores as to the erectores penis; for it draws down the penis from the oſſa pubis immediately after the ejection of the ſemen, and thus gives the blood a free paſſage out of the penis.

The conſtrictors of the urethra are the muſcles commonly called acceleratores urinæ: they ariſe partly from the precedent muſcle, and partly, and indeed principally, from the corpora nervoſa of the penis: from hence, proceeding obliquely, they ſurround the whole bulb, and the inferior ſpongy part of the urethra; and are, finally, inſerted into the line which is formed by the concourſe of theſe, and adheres to the bulb. Hence, when they act, they conſtringe the hinder part of the urethra, and by that means ſerve to expel the urine out of the urethra, but more eſpecially the ſemen in copulation.

Santorini, beſide theſe, has deſcribed certain new muſcles of the urethra, called projectores and elevatores; as alſo ſome muſcles of the proſtata ‡: but the moſt careful diſſection will only ſhew thin membranes in the place of them.

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* Cap. de Muſcul. Ani.

† See Memoirs of the Paris Academy 1700. Santorini alſo agrees with Veſalius in calling this muſcle a part of the ſphincter ani.

‡ See the ſame, p. 181.

CHAP. XVII.

Of the muſcles of the anus and bladder.

346. THE muſcles of the anus are generally ſaid to be three, one ſphincter, and two levators *.

The ſphincter of the anus cloſes the extremity of the inteſtinum rectum. It has its origin from the bottom of the os coccygis, and the ſkin that is under this bone; and its fibres, from hence ſeparating every way from one another, and ſurrounding the anus in every part, aſcend afterwards in men into the lower part of the bulb of the urethra, or into the acceleratores muſcles which ſurround this bulb, and are there terminated. In women they are inſerted into the lower part of the vagina of the uterus.

Many fibres alſo deſcend from the interior and lower part of the os pubis, near the ſynchondroſis; and forming a body of an oval figure, and of the breadth of a man's thumb, they ſurround the extremity of the rectum; and, when they act, have the ſame effect of drawing it together and cloſing it: there are, indeed, but few merely circular or annular fibres, ſuch as are uſually ſaid to compoſe the ſphincter obſerved in diſſection.

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* There are no muſcles of the human body in the deſcriptions of which authors differ ſo much as thoſe of the anus: this may be ſeen very evidently, on examining Riolan's Anthropolog. L. 5. c. 40. Cowper's Myotom. nov. p. 13. Douglaſs's Myograph. p. 66. Morgagni's Adverſar. Anat. 3. p. 59. and Santorini's Obſervations, p. 164. Theſe authors, tho' all accurate and excellent ones, differ widely, not only in regard to the number, but alſo the origin, progreſs, figure, and inſertion of the ſeveral muſcles they jointly allow of. Whether this be owing to the real difference of theſe muſcles in different ſubjects, or to ſome other cauſe, is not eaſy to determine. The expert anatomiſt, however, will uſually find them very regularly in moſt ſubjects, as our author here proceeds to lay them down, which he has done, not from the works of any, but from his own obſervation.

The levatores ani ariſe on each ſide, with a broad baſe, from the internal part of the os pubis, the tunic of the obturator internus, and the internal part of the os ileum, and the acute proceſs of the iſchium: from theſe parts fibres, in the manner of rays, running from a circumference toward a centre, directing their courſe toward the ſphincter; and, finally, they unite in the hinder part of the inteſtine which they ſurround, including at the ſame time the neck of the urinary bladder, the proſtata, and the veſiculæ ſeminales in men; and in women the vagina. They are, after this, inſerted partly in the upper and hinder part of the ſphincter, and partly confound and blend their fibres with thoſe of the oval and annular kind, which form the ſphincter; and from this courſe of their fibres it is very evident, that they may ſerve not only for the ſuſtaining and elevating the anus, but to preſs the veſiculæ ſeminales and proſtatæ in the coitus.

Beſide theſe levatores, which Douglaſs calls, by way of diſtinction, majores *, he deſcribes, in much the ſame manner as Riolan had before done, a pair of ſmaller levatores: theſe ariſe partly tendinous, partly fleſhy, from the protuberance of the iſchium; and are thence carried tranſverſely toward the anus, and are inſerted into its ſphincter, not far from the bulb of the urethra †.

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* See his Myograph. p. 68.

† Douglaſs does not tell us in what manner they are inſerted in the female ſubjects; but in diſſection ſuch muſcles are ſometimes, tho' not always, met with in women: in this caſe

The muſcles of the os coccygis are alſo two *, one on each ſide, called coccygæus, and ſeeming deſtined to be of ſervice to the anus in its neceſſary motions. They have their origin from the acute poſterior apophyſis of the iſchium, and are implanted on each ſide into the ſides of the os coccygis. Theſe, by pulling againſt the os coccygis, aſſiſt the levatores of the anus; and, when it has been forced too far outward, they reduce it in again into its natural ſtate; and prevent alſo its too eaſily changing its natural ſituation.

347. Authors allow the urinary bladder two muſcles, a ſphincter and detruſor.

The ſphincter we have already had occaſion to deſcribe, S. 222; and the detruſor, which is alſo mentioned in the ſame place †, is indeed no other than the muſcular coat of the bladder, which is an antagoniſt to the ſphincter, and ſerves to protrude the urine out of the bladder ‡.

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caſe they uſually ariſe from the upper part of the protuberance of the iſchium, near the origin of the erectors of the clitoris; and are inſerted into the upper part of the ſphincter, where they are joined to the vagina. Santorini, p. 206, tells us, that in women there are tranſverſe muſcles, which he compares to the tranſverſales of the penis in men, and figures them in tab. 2. letter g g. What are found in diſſection by an expert anatomiſt, will be found to be very like what he there deſcribes. It does not appear that they are always to be met with; and it is alſo difficult to determine whether we are to agree with Douglaſs, that they belong to the anus; or with Santorini, that they belong to the vagina.

* See Douglaſs's Myograph. p. 143. As alſo Cheſelden's Anatomy, and Morgagni's Adverſar. 3. p. 94.

† See figures of theſe in Cheſelden's Lithotomy, and in Cowper's Myograph. nov.

‡ Bianchi, in Magnet's Theatr. Anatom. p. 414. deſcribes certain new muſcles of the bladder, which he calls elevators and depreſſors, and has figured in two plates; but Morgagni and Santorini agree in determining, that there are in reality no ſuch muſcles.

348. The ſphincter, or conſtrictor of the vagina, is a ſeries of muſcular fibres, which ariſe from the ſphincter of the anus, and ſurround the orifice of the vagina from each ſide, and are afterwards inſerted into the crura of the clitoris. The opening of the vagina is drawn together, in the time of copulation, round the penis, by the help of this muſcle.

Santorini has deſcribed ſeveral other muſcles of the vagina and the urethra in women; but the moſt accurate diſſections do not ſhew any others that ought to be called by that name, nor is this the only caſe in which that author has done this*.

CHAP. XVIII.

Of the muſcles of the thigh, leg, and foot.

349. THE muſcles of the femur are fourteen: they are of various kinds, and ſerve to different purpoſes.

The proper flexors or elevators are three †: the great pſoas, the iliacus, and the pectinæus.

The pſoas magnus ariſes from the firſt, ſecond, third and fourth vertebra of the loins.

The iliacus ariſes from the internal cavity of the ileum, and the extremity of each is at the little trochanter.

The pectinæus, called alſo lividus, has its origin at the upper part of the os pubis, and terminates four fingers breadth below the former.

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* L. c. p. 207. and the following.

† There are many of the muſcles, however, aſſiſtant to theſe; as the abductor, the triceps, the glutæi, the faſcia lata; and, as Winſlow juſtly obſerves, the rectus tibiæ alſo.

The extenſors of the femur are the three glutæi, diſtinguiſhed by names from their ſize, and called maximus, medius, and minimus. They all ariſe in the external ſurface of the ileum, iſchium, and os ſacrum. The termination of the firſt or greateſt is about four fingers breadth from the great trochanter, and the terminations of the two others are in this trochanter.

The abductors are five; the faſcia lata, quadratus, pyriformis, and the two gemini.

The faſcia lata, called alſo muſculus membranoſus, more properly belongs to the tibia; tho', in compliance to the common cuſtom of authors, we name it here: it will be deſcribed at large in our next ſection, among the muſcles of that part.

The quadratus has its origin from the tubercle of the iſchium, and its termination at an eminence between the two trochanters.

The pyriformis riſes thick from the lower part of the os ſacrum, where it is joined to the ileum.

The gemini are two, and are diſtinguiſhed into the ſuperior and inferior.

The ſuperior has its origin from the poſterior and inferior ſpine of the ileum.

The inferior has its origin from the tubercle of the iſchium *.

Theſe two, and the pyriformis, are all inſerted into the ſinus of the great trochanter.

The abductor of the femur is the triceps. The firſt and ſecond heads of this muſcle ariſe from the os pubis, near the ſynchondroſis; the third from the tubercle of the iſchium: it is inſerted into the whole ſpine of the os femoris.

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* The two gemini are uſually found firmly concreted with the obturator internus; and hence ſome have deſcribed them, not as ſeparate muſcles, but as a part of that.

The rotatores, called alſo obturatores, are two, an internal and an external.

The internal ariſes from the internal circumference of the great foramen of the os pubis, paſſes the channel in the iſchium, and is inſerted into the hollow by the great trochanter.

The external ariſes from the external circumference of the foramen juſt mentioned, and is inſerted in the ſame place with the former. Theſe two muſcles aſſiſt alſo the abductors.

350. The muſcles of the tibia, or leg, are eleven.

1. The abductor, called the faſcia lata, and muſculus membranoſus, ariſes fleſhy from the anterior part of the anterior and ſuperior ſpine of the ileum: ſoon after its origin it becomes intirely membranaceous, and cloſely ſurrounds the muſcles of the thigh; after which it is inſerted in the upper part of the tibia, near the head of the fibula; and from thence ſends out an aponeuroſis almoſt over the whole tibia *.

The ſartorius is an abductor and elevator: it riſes from the internal part of the anterior and ſuperior ſpine of the ileum, and, deſcending obliquely, is inſerted into the upper and inner part of the tibia: it moves the legs upwards and forwards, determining them towards croſſing over one another, as taylors ſit with them.

The extenſors of the tibia are four: they are ſituated in the anterior part of the femur. They are,

1. The rectus: this has its origin from the anterior and inferior ſpine of the ileum †.

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* It ſerves alſo to draw back the thigh, and to elevate both this and the leg: this and ſome other of the adjacent muſcles are therefore common to both parts.

† This alſo aſſiſts the elevatores of the femur and the ſartorius in their motions; and, together with the pectinæus, pſoas, iliacus and glutæi, aſſiſts in the motion of ſeating ourſelves. See Winſlow's paper in the Paris Memoirs 1720.

2. The cruralis, which is ſituated under the former, and riſes from the whole anterior part of the femur.

3. The vaſtus internus, which riſes from the whole internal ſide of the femur.

4. The vaſtus externus, which riſes from the whole external ſide of the femur.

Theſe four muſcles together form a very robuſt and ſtrong tendon juſt above the knee, to which the patella adheres behind, and which is inſerted below the knee at a tubercle of the tibia *.

The flexors of the tibia are five:

1. The gracilis, which ariſes near the ſynchondroſis of the os pubis.

2. The ſemi-membranoſus, which ariſes above from the tubercle of the iſchium.

3. The ſemi-nervoſus, which ariſes from the ſame tubercle in its hinder part.

Theſe three are all inſerted into the interior and upper part of the tibia.

4. The biceps: the origin of the firſt head of this is from the tubercle of the iſchium: the ſecond riſes from the middle part of the femur; and its inſertion is in the ſuperior part of the fibula.

5. The poplitæus. This is a ſmall muſcle: it ariſes with a ſlender rounded tendon from the exterior condyle of the femur; and from hence it paſſes tendinous under the ham inwards: after this it becomes fleſhy, and terminates in the ſuperior and interior part of the tibia.

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* Almoſt all the muſcles of the leg mutually aſſiſt one another, as alſo thoſe of the thigh. There is ſcarce any one of them, that, beſide its primary uſe, does not alſo concur in the forming other actions and motions with the others.

351. The muſcles of the tarſus, or foot, are ſeven *. The flexors are two:

1. The tibialis anticus: this has its origin from the ſuperior and exterior ſurface of the tibia, and is terminated at the internal os cuneiforme, and the interior part of the internal metatarſal bone.

2. The peronæus anticus: this has its origin from the anterior part of the middle of the fibula, and is terminated at the exterior metatarſal bone.

The extenſors of the foot are three:

1. The gaſtrocnemius: this has its origin from the two condyles of the femur †.

2. The plantaris: this has its origin from the interior part of the external condyle ‡.

3. The ſolaris, which riſes from the upper and hinder part of the tibia and fibula.

The bodies of theſe three muſcles join together, and form the ſura; and their tendons joining, form an extremely ſtrong one, called the tendo Achillis, or chorda Achillis, which is inſerted into the hinder part of the calcaneum.

The adductor is the tibialis poſticus: it has its origin in the upper part of the interoſſeæous ligament, and its termination in the os naviculare *.

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* Theſe muſcles of the tarſus, and ſome of thoſe of the toes, are in robuſt ſubjects kept down by ligaments, eſpecially about the malleoli, to prevent their riſing out of their places in the time of their action: theſe ligaments ſerve alſo to direct, in ſome degree, their motions. See Veſalius, Fig. Muſc. 1, and 2. and what he adds in his chapter on ligaments.

† There frequently occur, in diſſection, two ſeſamoide bones in this part. Veſalius, Riolan, and Drake have figured them: they are alſo figured in this work, T. 1. fig. 2. D. E. Sometimes there is only found one, as Cowper and Fallopius obſerve.

‡ Cheſelden tells us, that he found a ſeſamoide bone in the origin of this muſcle. Morgagni alſo mentions it; but he ſays it is ſometimes wanting.

The abductor is the peronæus poſticus: it has its origin from the upper part of the fibula; but its tendon is turned back under the tarſus, and is inſerted into that bone of the metatarſus which ſupports the great toe. There is uſually, in old ſubjects, a ſeſamoide bone in the tendon of this muſcle, where it paſſes under the os cuboides.

CHAP. XIX.

Of the muſcles of the toes.

352. THE muſcles of the toes are of two kinds, common and proper. The common are ſixteen. The extenſors are two, a long and a ſhort one.

1. The extenſor longus has its orgin in the upper part of the tibia, and in the anterior part of the ligament, between the tibia and fibula. It divides into five tendons, four of which are inſerted into the four phalanges of the toes, and the fifth into the outer metatarſal bone †.

2. The extenſor brevis has its origin from the ſuperior and anterior part of the calcaneum: it is divided ſometimes into four tendons, ſometimes only into three, which are inſerted into the three toes next the great one, or into all the four.

The flexors of the phalanges of the toes are of three kinds;

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* This muſcle often has a double tendon, and is hence bicornate; and ſometimes it is almoſt entirely divided into two muſcles. Some authors have hence made two muſculi tibiales poſtici, a longer and a ſhorter.

† This fifth part makes the flexor of the tarſus, often forming a ſeparate complete muſcle; and ſometimes alſo it runs even to the little toe.

1. The flexors of the firſt phalanx are the four lumbricales: their origin is from the tendon of the muſculus perforans, and from the interior part of the calcaneum: their termination is at the firſt phalanx of the ſeveral toes.

2. The flexor of the ſecond phalanx is the perforatus: this riſes from the lower and inner ſurface of the calcaneum. It is divided into four tendons, which are perforated; and it is terminated in the bones of the ſecond phalanx.

3. The flexor of the third phalanx is the perforans: its origin is from the hinder ſurface of the upper part of the tibia, towards the middle: it is divided alſo into four tendons, and theſe perforate the tendons of the former, and are afterwards terminated in the third phalanx.

The adductores of the toes are the four internal interoſſei.

The abductores are the four external interoſſei; and both theſe are ſo nearly allied in ſtructure and properties to thoſe of the hand, that there needs no farther deſcription here *.

The proper muſcles of the toes, are thoſe of the great and of the little toe.

353. The proper muſcles of the great toe are no fewer than ſeven:

1. The extenſor longus, which has its origin forward from the middle part of the fibula, and of the interoſſeæus ligament; and its termination in the firſt and ſecond phalanx.

2. The extenſor brevis: its origin is in the upper and anterior part of the calcaneum, and its termination with the former in the firſt and ſecond phalanx †.

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* Govey will have all theſe interoſſei to be properly only one muſcle. Verit. Chir. p. 211.

† Theſe two often make but one muſcle, which terminates in two tendons.

3. The flexor longus, whoſe origin is in the poſterior part of the fibula, and its termination in the lower part of the laſt phalanx.

4. The flexor brevis: the origin of this is from the middle os cuneiforme; its termination is at the two ſeſamoide bones of the great toe, which are joined by ligaments to its firſt phalanx.

5. The abductor, or thenar: its origin is from the internal ſide of the calcaneum, and the os naviculare; and its termination at the internal ſide of the great toe, at the internal ſeſamoide bone *.

The adductors, or thoſe which draw the great toe toward the others, are two.

6. The anti-thenar; the origin of which is from the third os cuneiforme, and its termination at the external ſeſamoide bone.

7. The tranſverſalis: the origin of this is from the fourth bone of the metatarſus, and its termination near that of the former. This muſcle ſeems alſo to aſſiſt in the drawing the ſeveral other toes toward one another.

354. The little toe has only one proper muſcle, called its abductor proprius. This has its origin from the exterior part of the calcaneum, and the fifth metatarſal bone, which ſupports the little toe: its termination is in the exterior part of the firſt phalanx. This muſcle, however, is very ill named: the little toe cannot be drawn from the others by it. It indeed performs the office of a flexor, and ought to be called flexor proprius digiti minimi.

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* The internal ſide is that where the great toe is ſituated; the external, that which regards the other toes.

A COMPENDIUM OF ANATOMY.

BOOK VI.

Of ADENOLOGY.

CHAP. I.

Of the glands in general.

355. ADenology is the doctrine of the glands, called by the Greeks ἀδένες. The Latins ſeem to have given them their name glandulæ, from a reſemblance which ſome of them have to the acorn, or glans of the oak.

356. The parts to which the antients have given the name of glands, tho' they are as different from one another as poſſible in figure, ſize, and colour, yet are eaſily known and diſtinguiſhed as glands by all the world; tho' it is ſo difficult a thing to give a definition of what a gland is, or even a general character of them only, which ſhall include all the true glands, and take in no

other parts of the body with them, which the antients have diſtinguiſhed by other names from the glands, that the very beſt anatomiſts have choſen to evade the attempting to do it.

357. Many of the anatomical authors of the very firſt claſs, and among theſe ſome who have written profeſſedly of the glands, and have made it their peculiar buſineſs to examine nicely into their nature, and explain their ſtructure; have yet, from the mere difficulty of aſcertaining adequate ideas to the term, evaded giving a definition or general deſcription of the glands: and, in conſequence of this, numberleſs errors, and an almoſt inextricable confuſion, has crept into the ſtudy of this important part of the human ſtructure.

358. Other authors, who have had more boldneſs, if not greater abilities, than thoſe who had avoided meddling with definitions of theſe parts, have ventured to eſtabliſh what they call ſo; but theſe differ ſo much from one another, in what they would eſtabliſh as general certainty, and have produced ſuch imperfect and erroneous definitions, that they have all either included parts which themſelves will own not to be glands in the definition, or they have limited the term to ſome particular ones, and excluded what themſelves and every body elſe allow to be glands out of the number. Our author has treated largely on this ſubject, in a diſſertation entituled De vera Glandulæ Appellatione.

359. Some ſet out, in their definitions, with declaring a gland to be a globoſe part, &c. but theſe, in their ſetting out, exclude the pancreas, which tho' not of a globoſe figure any way approaching to ſuch, yet is truly a gland; and is, indeed, the largeſt and principal gland of the

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whole body, and has always been acknowledged a gland by authors of all kinds, from the firſt eſtabliſhment of anatomical diſtinctions to this day. In the ſame manner alſo the capſulæ atrabiliariæ, the parotids, and ſome other glands, truly and unqueſtionably ſuch, would be excluded from the number of the glands, becauſe they are not round; tho' they really are, and at all times have been acknowledged to be glands.

360. Others have given their definitions of glands, that they are ſoft, lax, and ſpongeous parts; but this is liable to the ſame kind of exception with the former. Nothing is more certain, than that we have glands which are neither lax, ſoft, nor ſpongy; but, on the contrary, are very hard, firm, and compact: and, on the other hand alſo, we have many ſoft, lax, and ſpongy parts which are not glands, as the lungs, the fat, and the like; which even the authors, who make theſe characters of glands, will allow to have no title to that name; tho' they muſt allow, that they are confounded with the glands under ſuch a definition.

361. Some have defined a gland to be a parenchyma, or ſoft, lax, and fungous kind of fleſh; but it is plain enough, from what has been obſerved above, that this definition is as falſe and defective as any of the former.

362. Among the later writers we have had ſome who have thought they had given a true, accurate, and perfect definition of a gland, when they tell us, that it is a congeries of veſſels of all kinds, or a part compoſed of ſuch a congeries of veſſels. But when we come to enquire ſtrictly into the ſtructure of the ſeveral other parts of the human body, do we not find almoſt all of them included alſo in this definition? The membranes,

the muſcles, &c. when nicely examined, are found to be congeries of veſſels of all kinds, as well as the glands; and, in conſequence, this definition does not in reality diſtinguiſh the glands from the ſeveral other parts of the body.

363. Others have improved on this laſt definition, and declared the glands to be formed of congeries of ſuch different veſſels, all included in one proper membrane; but this alſo confounds a number of other parts with the glands. The lungs, the heart, the ſtomach, the muſcles, and other parts of the body, as diſtinct from the glands as from one another, yet are as well charactered by this definition as the glands themſelves. What are all theſe but congeries of veſſels, included in their proper membrane? This definition, therefore, is as defective as any of the former.

364. Many writers on theſe ſubjects have aſſerted, that where ever there is ſecretion of any kind performed, there is a gland; and hence they have attempted to give a definition of a gland, not *a priori*, or from its fabrick; but *a poſteriori*, from the uſe to which that fabrick or ſtructure ſerves.

But this is as defective as any of the others: the principle on which it is eſtabliſhed is not true; for there are many ſecretions performed in the body, and thoſe even of the largeſt and moſt important kind, where yet there are no glands to perform them. The chyle is ſecreted in the inteſtines without the aſſiſtance of glands: the oſculæ of the lacteals, in the tunica villoſa of the inteſtines, abſorbing it without any farther aſſiſtance, from the matter protruded into them. In the ſame manner the ſemen is ſecreted in the teſticles; and the pituita in the pituitary ſinus's of the brain, where yet there are no glands at all. And in the ſame manner the fat is ſecreted in the cellules of the membrana adipoſa, which are extremely fine and thin follicles, where there never have been, nor probably ever will be any glands diſcovered *.

On the other hand alſo it is to be obſerved, that there are glands, received and allowed by all writers as ſuch, which do not appear to perform any ſecretions at all. Who is it that ever has, or ever will prove, with any degree of certainty, that the glandula pinealis, the pituitaria, the capſulæ atrabiliariæ, the thymus, the thyroides, the bronchiales, and ſeveral others that might be inſtanced, do in reality ſecrete any thing at all; and yet there never was an author of any age, who did not allow all theſe to be true and genuine glands.

It is not only that we of the more informed ages in anatomy have found that many of the bodies, allowed to be glands, do not perform any kind of ſecretion; but the antients themſelves agreed in giving the name of glands to ſeveral parts, tho' they were not aſſured that they ſecreted any thing at all, nor even in ſome caſes believed that they did. It is evident, therefore, that the antients did not give the name of glands to bodies which they knew to perform ſecretions, or even believed to do ſo; but evidently diſtinguiſhed them by

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* Schelhammer has very abundantly proved, that all the ſecretions are not performed by means of glands. Analect. Anat. Diff. 3. N°. 37. Mery alſo, in ſeveral papers in the Memoirs of the Paris Academy, proves the ſame truth. Littre and others were for making even the menſtrual diſcharges the effects of glandular ſecretions; but Mery proved that there were no glands in the part to perform this; and that many of the ſecretions, of moſt importance to the body, were performed without glands.

other characters, and named them from other qualities. We are to add alſo, that every beginner in anatomy, at this time, knows a gland to be ſuch, when he ſees it, only from its external appearance, and without knowing any thing of its uſe. There are, therefore, other characters by which a gland may be known, tho' by its office and uſe it cannot.

365. Some other writers, of the number of whom is the great Malpighi, have been led, by a miſtaken obſervation of morbid viſcera, ſtill farther from the truth in this matter than any of theſe: they have found, on diſſecting morbid bodies, ſuch in particular as had died dropſical, or in hecticks, conſumptions, and other chronick diſorders, certain bodies of a ſpheroidal form in the liver, the ſpleen, the peritonæum, the pericardium, &c. and have hence concluded, that theſe tubercles, becauſe they were of a roundiſh figure, were true glands; and conſequently that theſe ſeveral viſcera, in their natural ſtate, were compoſed wholly of ſuch corpuſcles, and of congeries of minute and innumerable glands. But this is fallacious in the higheſt degree: theſe tubercles are ſo far from being real glands, that they are morbid tumors of the atheromatous or ſteatomatous kind, or congeſtions of terreſtrial and tartareous matter, grandines, and the like things; which are ſo far from conſtituting theſe viſcera in a healthful ſtate, that they are not even found in them in ſuch ſtate, but are merely diſeaſes.

366. To the obſervation that theſe bodies are not found at all, or, at the utmoſt, are not common or neceſſary parts of the viſcera in a healthful ſtate, it is to be added, that their formation is eaſily accounted for, on the principle of ſup-

poſing them the effects of a diſeaſed habit; ſince ſtagnations of thick, viſcid, or terreſtrial matter, in the minute veſſels of theſe parts, may eaſily, nay and muſt neceſſarily, form connections of this kind with this roundiſh figure, and with all the characters of theſe morbid tumors, tho' with not one of the true or genuine characters of glands.

Whatever is natural, and an effect of the common courſe of things, is to be ſought after in ſound bodies, not in morbid ones: when we depart from this natural and neceſſary rule, we fall into numberleſs errors. How frequently, in diſeaſed ſtates, do we find the arteries, and ſeveral of the membranes, grown cartilaginous, or almoſt boney? But are we to infer from this, that the natural ſtate of theſe arteries and membranes is cartilaginous and boney? Certainly no body will pretend to aſſert it. Beſide theſe ſpheroidal bodies or tubercles are found, not only in the liver and ſpleen of a hog, for inſtance, but frequently alſo in the lungs of the ſame animal, and theſe not only on the ſurface of the lungs, but throughout the whole inner part: and it is not only in quadrupeds, but in human bodies, where there has been a long continued hectic, the lungs are found full of the very ſame kind of roundiſh bodies or tubercles. Malpighi, and others alſo, who have contended for theſe tubercles being glands, have obſerved the ſame; but ſurely no one, who underſtands but a little of the human frame, will declare the lungs, for this reaſon, to be a glandular part. The ſame ſort of tubercles, or round bodies, are alſo found in the ſubſtance of the uterus; yet ſurely no body from this will pretend, that the uterus is naturally of a glandular ſtructure. If it appear certain then, as it muſt do in the eye of reaſon, that theſe viſcera are not of a glandulous ſtructure, tho' theſe kind of tubercles are found in them, when in a morbid ſtate, why are we to ſuppoſe, that the other viſcera are of that ſtructure, becauſe theſe tubercles are found in them in the ſame morbid ſtates? Why, in particular, are we to ſuppoſe the ſpleen a part, in which we know of no ſecretion being performed, nor any of the actions of a gland executed, to be of a glandulous ſtructure, merely becauſe, in a morbid ſtate, morbid tumors, which have ſomewhat of the figure of glands, are found in it? All Malpighi's * experiments and obſervations have not proved, that theſe bodies are true glands; or, indeed, that they have any of the properties of glands. They are uſually found in the ſuperficial parts of the viſcera eſpecially, if not only there; and this is not the place where they might be expected, if deſtined for the uſes of glands: and ſurely, tho' they are found in the pericardium, no body would ſuppoſe that that membrane is glandular.

367. Others, in diſſections of particular bodies, have found veſicles in the brain, the liver, the kidneys, and other parts; and hence have declared them alſo to be glandulous in their ſtructure †: but in this caſe, as in the others, the bodies diſſected were all morbid ones; and as the ſame veſicles are not found in healthful ones, nor indeed any thing analogous to them, it is a ſufficient proof that they are not natural parts of the ſtructure of them.

Malpighi, who is one of the ſtrongeſt aſſertors of this doctrine, yet allows that the parts do not appear at all like what they uſually do, when they

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* See him where laſt cited.

† See Malpighi, 16.

have theſe veſicles. He tells us of one large veſicle *, often taking up the place of the whole brain: he gives the cauſe alſo of the accident; but if he had even omitted that, a ſtate like this could never have been ſuppoſed the natural condition of the part.

We are to obſerve, that the antients never called veſicles by the name of glands, nor ever underſtood any thing of that kind to be of the nature of glands. Here alone we ſhall have innumerable errors and confuſion about the meaning of words, if, while we pretend to mean by the term gland what the antients meant by it, we expreſs, under the ſame name alſo, things ſo different from every thing they intended by it. If we could, indeed, allow theſe diſeaſed parts to be in a ſtate of nature, we ſtill ought not to call them glandulous: why not rather veſiculous kidneys, veſiculous livers, and veſiculous brains? The lungs are, indeed, of a veſiculous texture, even in their natural ſtate: they are compoſed merely of veſicles, yet no body, not even Malpighi himſelf, ever confounded the ideas of a veſicle and a gland, ſo far as to call them glandular; but all the writers, of any ſort of credit, have continued to call glands *glands*, and veſicles *veſicles*, and to call thoſe parts vaſcular which are compoſed of veſſels. There are manifeſt and evident veſicles in the ovaries, in their natural ſtate; yet no body has ever, for this reaſon, declared the ovaries to be glandular bodies. It is wonderful, therefore, that authors ſhould have made ſo ready concluſions of this kind, from the merely morbid ſtate of particular parts, when they neither do it themſelves, nor find others doing it, in the ſame condition of healthy ones. Littre, from finding veſicles in the kidneys * of a diſtempered ſubject, declares the kidneys, in their natural ſtate, in all bodies, to be glandular; but Ruyſch has proved them to be entirely vaſculous, and experiments daily confirm the truth of it. Certainly there being veſicles found accidentally in a pair of kidneys, is of no force to prove all kidneys to be glandular, even if this proof of the contrary had been wanting.

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* Epiſt. de Gland. p. 6.

368. It will be anſwered to our eſtabliſhing a vaſculous ſtructure of theſe parts, againſt the ſuppoſed glandular one, that vaſculous and glandulous parts may be the ſame; that the terms expreſs no contradiction; for that all glandulous parts are naturally vaſculous; and that a vaſculous part may, without impropriety, be called glandulous †: but it is to be obſerved, that this is confounding things which are in themſelves ſufficiently diſtinct, even tho', in ſtrictneſs, the aſſertion be true. Authors, of any degree of accuracy, have expreſſed very different things by the terms *vaſculous* and *glandulous*; and tho' glands are compoſed of veſſels, yet thoſe veſſels, in order to form glands, muſt be of a particular kind and ſtructure, and particularly arranged: a part may have theſe veſſels, without their being arranged into glands; and is then properly enough diſtinguiſhed, as to its ſtructure, by the term vaſculous, as having no right to that of glandulous.

All the parts of the body are unqueſtionably vaſculous, and if, for this reaſon, they were intitled to the name of glandulous, the whole body is to be declared at once to be compoſed of glands.

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* See Memoirs of the Paris Academy 1705.

† Michelotti, in his Book de Separatione fluid. argues thus.

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Every one muſt ſee the abſurdity of this; and every one muſt alſo ſee, that, in ſpite of the quibble, as to the definitions, two very different kinds of ſtructure are underſtood by the terms vaſculous and glandulous; and that it would bring great confuſion into the anatomical writings to confound them, or uſe them ſynonimouſly.

369. Malpighi, to whom much of this confuſion is owing, aſſerts, that in every gland, however minute and ſimple, as well as in all thoſe which he pleads for in the viſcera, there muſt neceſſarily be a veſicle or follicle placed between the extremities of the arteries, veins, and excretory ducts, by which the ſecretion of the part is performed; and theſe natural veſicles of the glands, when dilated and expanded by ſome diſtemperature of the part, he ſays, form what we call veſicles in theſe viſcera. He is not without his followers in this ſyſtem; but the moſt accurate anatomical writers declare againſt it, as a new hypotheſis formed in the imagination, and not ſupported by any facts: they do not allow either, that there are any glands at all in theſe viſcera in their natural ſtate; or that there ever were any ſuch ſeen, much leſs that theſe folliculi in them ever could be ſeen. But to this we are to add, from frequent obſervation, that it is not neceſſary there ſhould be either any glands, or any follicles in glands, from which to form theſe morbid veſicles; for that the ſmall veſſels of theſe parts may as eaſily, perhaps more eaſily, be diſtended into theſe kind of little bladders, than even thoſe follicles, if there were any ſuch parts. Ruyſch * and Rauholt have obſerved ſuch veſicles in the placenta uterina, which all the world muſt

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* See Memoirs of the Paris Academy 1714, 1715, 1718.

allow to be a part merely vaſculous; as alſo in the lungs, in the ſuperficies of the cutis, in the eyes, and in other parts, where there never were any glands found, nor indeed any glands ever ſuppoſed to exiſt. What happens in theſe parts without the aſſiſtance of glands, may alſo happen in the liver, the kidneys, and the brain, without glands; and 'till we have better authority for declaring that there are glands naturally in thoſe parts than we have at preſent, we can have no right to ſuppoſe theſe veſicles to be the effect of glands diſtempered, according to Malpighi's ſyſtem. It is not the buſineſs of an anatomiſt to aſſert, or to ſuppoſe, but to demonſtrate: he is, therefore, not to take any thing for natural, that does not appear in a natural and healthful ſtate of the body; for in ſtates out of nature, and the effects of diſtemperatures, there are ſo many monſtroſities, ſo many variations of nature from her ordinary courſe, that nothing but error can be the effect of eſtabliſhing what is the natural ſtructure of the parts, from what appears in them in theſe ſtates.

It is to be obſerved alſo, that the true and genuine glands, as the ſalival ones, thoſe of the meſentery, the pancreas, the thymus, &c. are ſeldom, if ever, found thus transformed into veſicles; which yet, if it happened ſo eaſily as Malpighi makes out, ought to happen very often. From this alſo it appears, that the parts truly glandulous ſcarce ever become veſicular; yet vaſculous parts very frequently do do: it is a change that very eaſily happens in theſe, tho' very difficultly, or ſcarce at all, in the others; and that, tho' theſe veſicles deceive many with an opinion of their being of glandulous origin, they are truly no more than diſtended little veſſels. It has been objected, that nature ſtill pleads for the caſe of the follicles of glands being converted into veſicles, as well as for the difficulty of the ramifications of veſſels being ſo diſtended; but this is aſſerting without proof, and taking up our own ideas as certainties: if it were true, the conſequence muſt be, that veſicles muſt be very frequent in the parts which are truly glandular; and very rare, or ſcarce ever ſeen at all, in thoſe which are vaſcular only: but we ſee exactly the contrary of this happen, and therefore have great reaſon to ſuppoſe, that the contrary to the aſſertion is true. It appears, therefore, that there are none of theſe follicles of Malpighi in the glands of theſe parts; or elſe, that the ramifications of veſſels are much more eaſily diſtended into theſe veſicles than ſuch follicles are, altho' the reaſon may not appear to us why it is ſo. But let us allow the followers of Malpighi, that there are ſuch follicles in ſome of the glands at leaſt: it does not follow from this, that there are ſuch and ſo numerous ones, in all the parts which they aſſert to be glandulous. The Creator of our bodies has not, in any of the other parts, tied himſelf down to any ſuch fixed laws; but has varied in the ſeveral parts, as they were deſtined for ſeveral different purpoſes. Many of the aſſerters of Malpighi's doctrine, that they may have the more room for defending the ſyſtem of glands eſtabliſhed by him, underſtand the term *follicle* in a very lax ſenſe: they affirm, that the long ſeminal veſſels of the teſticles, nay and even the whole tract of the inteſtines, to be each a mere glandulous follicle; but, with the ſame reaſon, they might eſtabliſh the ſtomach, the pericardium, the tunica vaginalis of the teſticles, the peritonæum, the pleura, and whatever parts they pleaſe to be follicles; and they may reſolve

ſolve all the parts of the body into mere glands. This, however, we are to put them in mind, is running away from an argument, not ſupporting it: every one, who is unprejudiced, will ſee how wild a notion this is entertaining of a follicle of a gland.

370. There is nothing that we are more certain of, in regard to the animal œconomy, than that ſecretions may be and actually are performed in many parts of the body, without the aſſiſtance of any of theſe follicles, though Malpighi has eſtabliſhed them as ſo neceſſary and eſſential a part of a gland*. Not to mention the ſimple ſecretions of the chyle, and of the fat, which we have already taken notice of on a former occaſion, ſuppoſe we would allow ſuch a part as this follicle of Malpighi in a ſimple gland a veſicle, about which the ultimate ramifications of the vein and artery of the part were diſſeminated; and in which, as theſe authors aſſert, the excretory duct of the gland has its origin! Still allowing even all this, the follicle has nothing to do with the buſineſs of ſecretion performed in the part; but is a mere receptacle to the liquor ſecreted by the other veſſels. The liquor contained in the excretory duct of a gland, or in this follicle, if it communicate with it, as theſe writers aſſert, is evidently already ſecreted; nothing is to be ſecreted there. Secretions, we very well know, are not made even from the veins, excepting only in the ſingular inſtance of the liver, where the vena portæ acts as an artery, and performs the

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* Michelotti, in other parts of his works, departs from this opinion; but he is moſt in the right, when he maintains it moſt warmly.

† Malpighi allows the lymph to be a ſecretion from the arteries. See his Epiſt. de Gland.

offices of one; for the veins ſerve only to carry back the blood, after the ſecretions have been made from it. It is certain, that ſecretions are performed in the arteries, and particularly in their lateral canals; which, it is probable, are produced from the ſides of the minute ramifications of the arteries, in the very ſame manner as the chyliferous veſſels are propagated from the ſides of the inteſtines; tho', in the former caſe, they are too minute to become the objects of our ſenſes *.

It is in this manner that, we ſuppoſe, ſecretions are performed in the brain, the kidneys, the liver, the teſticles, the cutis, the other membranes, and even in the glands themſelves. But as nature is uſually ſimilar to herſelf, in the ſeveral parts deſtined to the ſame purpoſes; and as theſe follicles, ſo warmly contended for by Malpighi and his followers, either do not exiſt at all, or, if they do, perform the office of receptacles, not of ſecretory organs; it ſeems much more eligible to take our ideas of the other more abſtruſe and hidden ſecretions, from that open and obvious one of the chyle, than to fall into ſo doubtful and dark a ſyſtem as this, in which we ſee no analogy to the other actions of the ſeveral parts of our ſtructure, and for which we have no evidence of the very exiſtence of the ſuppoſed parts.

371. If therefore we would avoid the equivocations between the words glandulous and vaſculous, and conſequently avoid the error and confuſion that have got into the world from them, we are firſt to diſtinguiſh, that the ſame thing is not expreſſed by both theſe terms; but that they expreſs parts, which as they differ from one another in external appearance, in ſhape, and in

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* Michelotti agrees in this opinion, l. c.

their very nature, ſo they ought to be expreſſed by words never confounded with one another. The viſcera, therefore, which are found, by inſpection with the naked eye, by the more minute examination with the microſcope, and by injections, to be truly and merely vaſcular; and in which, in their natural and healthful ſtate, there are no ſpherical corpuſcles found; and which are incloſed in a peculiar and appropriated membrane, are all to be called vaſcular parts. There is nothing of the appearance or ſtructure of glands in theſe, and they therefore are not to be called glandular; but that term is to be appropriated to parts truly glands, or in which true and proper glands are found: by this means alone, a multitude of confuſion, apparent in the writings of the late writers on theſe ſubjects, will be avoided *.

372. If, after this, it be aſked what is truly glandulous, or what is really a gland, it is to be anſwered, that as the lateſt and beſt writers are not agreed in the definition of a gland, we are to enquire what it truly and properly was that the antients underſtood by this term; and, after this, what was their reaſon for calling theſe parts by this name: by this means we ſhall, at leaſt, keep up to that excellent rule of Morgagni's on this ſubject, not to change the names by which the old writers have called things, without reaſon. We find, that they called by this name the pineal and pituitary glands, the parotids, the maxillaries, the jugulars, the thyroide, the thymus, the pancreas, the meſenterick, the axillary, the inquinal, and ſome other glands †. We are therefore, in

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* Michelotti here departs from his common opinion, and declares vaſculous and glandulous to be the ſame thing.

† See Hippocrates, Lib. de Glandulis; and the other antients on the ſame ſubjects.

conformity to their methods, to call theſe, and ſuch other parts as have a like ſtructure, figure, and appearance with theſe, by the name of glands, even tho' many of them were not known to theſe writers. This is the way of naming new diſcovered things after old and known ones.

373. As to the latter part of the queſtion, namely, why it was that they called theſe parts by the name of glands, we are certain, firſt, that it was not from their being of a globoſe or ſpherical figure; becauſe, if it had been for this reaſon, they would not have called the pancreas and the thymus by this name: nor was it from their being of a ſoft, lax, and ſpongy texture; for then they would have excluded all the more firm, compact, and hard ones from the number, and would have taken into it the lungs, the fat, and all the other parts of the human fabrick which are of that lax and ſpongy ſtructure: neither, thirdly, did they give the name of glands to theſe parts, becauſe of their uſe in the ſecretion of certain fluids; for it is evident from their writings, that they did not know that any ſecretion at all was performed in the far greater part of what they called by this name, the diſcovery of the offices of moſt of the allowed glands of the antients not having been known 'till within the laſt century. On the other hand we are alſo to obſerve, that tho' they knew very well that ſecretions, and thoſe very large and important ones, were performed in ſeveral of the viſcera, as in the liver, the kidneys, and the teſticles; yet they never ſuppoſed or called theſe glands: they ſuppoſed that the ſpleen alſo ſecreted a black bile from the blood; but tho' this was an eſtabliſhed doctrine in their writings, they never called the ſpleen a gland.

Thoſe writers, therefore, who are for calling all parts in which ſecretions are performed, and only ſuch parts, by the name of glands, diſſent greatly from the opinion of the antients, who did not limit the term to ſuch parts. On this plan a number of parts muſt be called glands, which the antients not only have not called by that name, but which they have had other determinate names for; as the uterus, the lungs, the cutis, and the inteſtines: and, on the other hand, a great many parts, which they called glands, muſt no longer be received as ſuch; becauſe we do not know that they ſecrete any thing, or that they were not deſtined by the Creator to anſwer ſome other purpoſes unknown to us, and very different from theſe; ſuch are the thyroide, the bronchial, the pituitary and the pineal gland, with ſeveral others.

374. It is evident, therefore, that the antients called certain parts of the human body glands, and that for no other reaſon but becauſe they found them compoſed of a peculiar kind of fleſhy ſubſtance, of a peculiar habit, or of a peculiar external appearance, without paying any the leaſt regard either to their internal ſtructure, their ſpherical figure, or their uſe. Since, therefore, we cannot change the ſenſe and ſignification of the terms uſed by the antients, without confounding the things deſcribed under them, we are not to do it without a ſufficient reaſon; which reaſon we can never have, as to the glands, till we are much better acquainted with their true characters, nature, and uſes than we can pretend to be at preſent. We are not to give the antient name gland to parts as different as poſſible from thoſe to which the antients themſelves gave it; nor ought any part, at this time, to be called a gland,

unleſs it has that general external appearance, or peculiar habit, which the other glands, ſo called by the antients, have; and from which it was that they came to be ſo called, notwithſtanding that they ſhould have a ſimilar internal ſtructure, or even, as appears to us, a ſimilar uſe with ſome of the genuine glands. Michelotti is againſt this ſyſtem; but his objections to it will be anſwered hereafter in their place.

375. We ſhall not, therefore, repeat in this place what a gland properly is, or how it is to be defined: we have already aſcertained, on theſe principles, what parts they are that are truly and properly called by this name (S. 33); and that in ſuch a manner, that tho' there ſtill wants a ſufficiently accurate definition of a gland, yet an unprejudiced perſon will not fail to know, at ſight, what he ought to call by that name.

376. It will be aſked, perhaps, why, in order to the diſtinguiſhing the glands, we have recourſe to this peculiar habit and general appearance in them. But we are to anſwer, that the neceſſity is evident: there is, in the peculiar appearance of the gland, a diſtinguiſhing ſingularity eaſily perceived, tho' not eaſily deſcribed; and that as no author has given, or has been able to give, tho' he attempted it, a proper, expreſſive, and punctual definition of a gland, we are to uſe this as it is, tho' leſs determinate than moſt other characteriſticks, yet leſs apt to deceive than many. Tournefort and Ray, when they are deſcribing the different genera of plants, often have recourſe to the habit, or peculiar external face of the plant, and find it neceſſary to make this a diſtinction; where tho' the plants, they are deſcribing, are evidently of different genera, yet the difference is not eaſily explained with accuracy. Every body

will allow theſe plants to be different, though no one ſhould be able to ſay in what the difference conſiſted, and tho' only the facies externa of the plant could be called in as the characteriſtick of it *. As this has been allowed to the botanical writers, why ſhould it not be allowed to the anatomical ones, in a like caſe, where a perfect definition or deſcription has not, nor can be given: we do not, however, wiſh to force this determination upon any body; nor ſhall we be againſt retracting it, as ſoon as ſome authors ſhall find the way to do what has not been done yet, that is, to give ſuch a definition of a gland, without having recourſe to its external habit, as ſhall include all the glands of the body, nothing but the glands, and ſhall ſufficiently diſtinguiſh them from the other parts.

377. If it be aſked what this particular habit in the glands is, or how we are to know it, when we meet with it; we are to anſwer, that the peculiar complication and arrangement of the veſſels, from which there ariſes a form obviouſly diſtinguiſhable at ſight from the muſcles, the fat, the bones, the membranes, the veſſels, and, in fine, from every other part of the human fabrick, which gives a ſufficiently certain, determinate,

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* Tho' Ray and Tournefort were reduced to have recourſe to this vague method of diſtinction in ſome caſes, we have ſince found, that it was not neceſſary. Nature has impreſſed characters ſufficiently diſtinctive and certain in the ſtamina, piſtill, and other parts of the fructification of plants, to diſtinguiſh all the really diſtinct genera. It was only during the ignorance of the world, as to the nature of theſe parts, that ſuch uncertain marks of diſtinction, as the habit of a plant, were called in. Linnæus has not found it neceſſary; nor has any author in botany, ſince his excellent eſtabliſhment of generical diſtinctions, ever had recourſe to it.

and ſtriking notice of it. This habit, ariſing from the complication juſt mentioned, will always be known at ſight; and tho' it is ſuch as can never be deſcribed by any determinate words, yet it will never be miſtaken. Ray obſerves, that it would be very difficult to give ſuch a character or definition of common moſs, as ſhould diſtinguiſh it from all other plants; and yet that its habit, or facies externa, will always ſufficiently and invariably diſtinguiſh it to the eye. Neither the ſkilful nor the unſkilful will find it difficult to diſtinguiſh it from other plants, tho' they can neither of them expreſs how it differs; and juſt ſo every body will, at ſight, be able to diſtinguiſh the glands from the other parts of the body, tho' they cannot ſay, in determinate words, what it is that the difference, they ſo obviouſly ſee, conſiſts in *.

378. Whatever part, therefore, has been called by the antients a gland, or has the external habit and appearance of thoſe parts which the antients have called glands, we are to acknowledge to be ſuch: and whatever part wants or differs from this habit, or general external appearance, ought, to avoid confuſion, to be excluded from the number of what we call glands. The antients, we are to obſerve, not only acknowledged the large glands, which we have occaſionally mentioned,

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* If our author's compariſon in this caſe be juſt, we may hope to have ſometime this great anatomical deſideratum, a definition of a gland, ſupplied. That Ray could not diſtinguiſh common moſs by a ſufficiently accurate deſcription, was owing to his not underſtanding perfectly the characters and fructifications of that plant. Dillenius has ſince found the way to convey, in ſufficiently diſtinctive and accurate terms, a deſcription of that plant; by which its difference not only from other genera of plants, but from the other ſpecies of the ſame genus, is obvious; tho' even Dillenius was far from knowing all that he might have diſcovered on this ſubject.

and others of conſiderable magnitude for ſuch, but they readily allowed the ſame name to many very ſmall ones, particularly to thoſe of the meſentery; in which part there are a multitude of minute bodies, which every body who ſees them, and who has before ſeen only a few of the other acknowledged glands, will immediately declare to be glands alſo. Where ever, therefore, there are found parts, whether larger or ſmaller, that have this peculiar habit, which is ſeen in all thoſe parts which the antients called glands, this part is alſo, without any regard to its ſize or other qualities, to be called a gland.

379. On this principle we are to exclude from the number of the glands, properly ſo called, the cortical ſubſtance of the brain; ſince neither the naked eye, nor even the aſſiſtance of a microſcope, can diſtinguiſh in it any thing that has that peculiar habit or appearance, which is the charactериſtick of the bodies called glands by the antients; and ſince injections have, on the contrary, ſhewn us that it is truly vaſculous, or a mere congeries of fine and elegant veſſels.

Hippocrates, in his book on the glands, ſays, indeed, that the brain is like a gland; but he does by no means affirm in this, that the brain is a gland; for, ſurely, what is like another thing, is not therefore to be eſtabliſhed as the ſame.

The ſame has been ſaid of the liver, the ſpleen, and the teſticles, namely, that they are like glands: but Ruyſch, Lewenhoeck, Vieuſſens, and Berger, have all joined in affirming what experiments have abundantly confirmed ſince; namely, that theſe ſeveral parts have, in their natural ſtate, nothing that at all reſembles the figure or habit of a gland in them: but, on the contrary, that veſſels in their uſual and natural directions, are found in vaſt abundance in every part of them. It is with great reaſon, therefore, that theſe parts are eſtabliſhed as vaſcular, inſtead of being called, as they uſed to be, glandular; for they are truly vaſculous, and the name expreſſes very properly what we conſtantly meet with in their ſtructure.

Nothing, however, ought to ſtrike the judicious anatomiſt with more ſurprize, on this occaſion, than the finding authors declare the ſpleen to be glandulous; becauſe, in morbid bodies, there have been ſometimes found a number of tubercles in it. The ſpleen, ſo far as is yet known, ſecretes no fluid at all, nor is deſtined to any ſuch uſes as theſe authors themſelves are for making a part of the characteriſticks of glands; but, in all probability, has an office of an extremely different kind, in the execution of which it can have no neceſſity for any gland at all, nor for any thing of the peculiar ſtructure of the glands. If the antients had run into the error of calling the ſpleen a gland, their eſtabliſhed opinion, tho' a falſe one, of the atrabilis being ſecreted in it, would have excuſed them; but if they who really ſuppoſed a ſecretion performed in it, yet did not allow it for a glandular part, ſurely thoſe who do not allow it ſo much as the office of a gland, are unpardonable in ſuppoſing it of the nature of thoſe parts. The moſt accurate of the modern anatomiſts agree, that no ſecretion is performed in the ſpleen; nay, that it has no excretory duct: to what end, therefore, are they to make it of a glandular ſtructure? Every thing that the ſpleen has been ſuppoſed, by any modern writer, to perform, may be much better performed by means of a vaſcular ſtructure than by a glandular.

If the kidneys of a human ſubject, a hog, a dog, a calf, or almoſt any other quadruped, be examined, whether raw or boiled, or macerated in water, their whole outer as well as inner ſubſtance is found to be vaſcular, or compoſed merely of tubes of different diameters; but as to the round bodies of which thoſe, who plead for their being glandular, pretend that they are compoſed, the moſt accurate examination will never ſhew any thing at all like them in a kidney that is ſound, or in its natural ſtate.

Ruyſch is of opinion, indeed, that ſomething like round tubercles had occaſionally occurred to him, in the diſſections and examinations he had made of theſe parts; but, moſt probably, they were merely morbid tubercles, ſince, if natural, a man of his accuracy would not have found them only in ſome few ſubjects, but in all. But even allowing what this author hints at to be natural, ſo few and ſo minute glands, even if they were ſuch, could by no means be ſufficient to anſwer the purpoſes of ſecreting a fluid, ſo abundant in quantity as the urine. The teſticles, in the ſame manner, are agreed, by all the accurate writers of this time, to be vaſcular *. And in the pleura, the pericardium, the peritonæum, and the tunica vaginalis, there are naturally no bodies that have any thing of the appearance of glands. There are, indeed, of a certainty, no glands there; and as to the tubercles, which have at times been met with in them on diſſection, they have been all morbid ones.

380. The differences of the glands among themſelves are eſtabliſhed by many authors as very numerous. It will not be neceſſary to run into the whole diſquiſition: we ſhall ſelect a few

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* See our figure, T. 6.

which are more generally eſtabliſhed than the reſt, and of more immediate and real uſe. We ſhall firſt divide them into two general kinds, the ſimple, and the conglomerate.

The ſimple glands, called alſo conglobate glands, conſiſt of a ſingle diſtinct body, of a figure approaching to round, and are incloſed in their proper membrane.

The conglomerate, or, as they are otherwiſe called, compoſite glands, conſiſt each of a number of ſmaller glands, arranged together, as it were, into one maſs, and contained in one common tunick.

The glands differ alſo greatly in regard to their conſiſtence. Some of them are conſiderably hard and firm, and others of them are extremely ſoft and tender: of the latter kind, in particular, are the glands ſituated in the articulations of the bones of the ſeveral parts of the body.

They differ alſo very conſiderably in colour. Some of them are of a pale whitiſh red, or fleſhy colour; others of a ſtrong, deep red; others yellowiſh, or browniſh; and ſome evidently blackiſh.

Their differences in figure are as conſiderable alſo as thoſe in colour. Some of them are round, others oval, others oblong, and many others of figures as different as well can be from any one of theſe regular ones: the pancreas, the thyroide, and the thymus, are inſtances of this. Some of them have obtained their names from their peculiar figure: of this number are the glandula pinealis, the milliares, and others.

Their uſes are alſo as different as either their colours or figures. Some of them are ſalival, mucoſe, and lymphatick: others are mucilaginous, ſebaceous, and waxy; others lachrymal, pituitary, &

&c. and from theſe, their ſeveral contents or ſecretions, they are named lachrymal, &c.

Their ſituation is alſo another article in which they differ, and from which many of them have their ſeveral names; ſuch are the parotides, maxillares, linguales, thyroide, palatine, labial, jugular, cervical, axillary, inquinal, lumbary, inteſtinal, meſenteric, renal, &c.

And, finally, their ſize is a thing in which they differ moſt obviouſly and eſſentially.

CHAP. II.

Of the glands in particular.

381. AFTER we have thus been at the pains of diſtinguiſhing what parts of the human body properly are, and what, though called ſo by ſome, properly are not glands, we are to proceed to deſcribe ſuch as are truly and properly of this denomination.

In the firſt place, we are to examine what are the glands of the head. If any one is for affirming, on the doctrine already examined, that the whole cerebrum is one gland, becauſe Hippocrates, from ſome ſimilitude which he thought he ſaw between the brain and the glands, called it, as before obſerved, a body reſembling a gland *; we ſhall not be at any trouble in confuting the opinion, tho' the reſt of the antients are all of them againſt it: but that the cortical part of the brain is, as Bidloo † has figured it, a mere congeries of ſmall glands; or is, in its natural ſtate, compoſed of innumerable minute globular bodies, we can never agree. Hippocrates himſelf, tho' he compares the reſt of the brain to a gland, is againſt this; and nothing is more evident, from experiment, than that it is wholly falſe.

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* Lib. de Glandulis.

† Anatom. T. 10. fig. 2.

In the ſinus's of the dura mater, and out of them at the ſides, there are indeed found a number of the ſmall glands deſcribed by Pacchonius *; and there are ſometimes others viſible in the foveæ of the os frontis, and about the diviſions of the veſſels, between the dura mater and the arachnoides, as deſcribed by Santorini. Something, however, there is in his account of theſe laſt, that is perplexing: he ſays expreſly, that they are ſituated about the trunks of the veſſels, between the dura mater and the arachnoides; but as there are no conſpicuous veſſels in the tunica aracnnoides, it is not eaſy to underſtand what he means by the place of their ſituation. We ſometimes find ſome of them about the diviſions of the larger veſſels of the pia mater; but whether theſe are the ſame with thoſe of Santorini, is a point not eaſily decided: it rather appears, that they are not.

Sometimes alſo we meet with cluſters, as it were, of the ſame ſort of glands, in the hollows of the os ſincipitis, which are frequent, not far from the longitudinal ſinus; and theſe, in the ſame manner as thoſe of Santorini, in the hollows of the os frontis, were not covered; but the dura mater was deficient, and, as it were, perforated in that part.

Theſe glands ſeem deſtined for the ſecreting of a fluid, to moiſten the dura mater.

The glandula pinealis, already deſcribed in its place, is alſo to be eſteemed a gland of the brain; and the glandula pituitaria is alſo to be mentioned:

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* De Gland. Conglob. Dur. Matr.

this is placed under the brain in the ſella equina; and has alſo been deſcribed in its place.

The uſes of theſe glands are very little known: we have but conjecture for it; and that, in general, but very indifferently agreeing with reaſon. Not only diſſection, with the aſſiſtance of microſcopes, but even careful and very ſucceſsful injections, join to ſhew us that there are no glands; nor, in a natural ſtate, any round bodies in the plexus choroides.

382. In the exterior part of the head, that is, out of the cavity of the ſkull, we have the parotids, the maxillary glands, the ſublinguals, the linguals, the labials, the palatine, and the buccales, which are diſtributed here and there about the membrane of the mouth, and have been already deſcribed in their place. In the orbit alſo there is the glandula lachrymalis, long called glandula innominata, which we have alſo already deſcribed in the enumeration of thoſe parts. Under the eyelids alſo there are the glandulæ ceraceæ, or ſebaceæ of Meibom; but in the uvea of the eye, where many authors have eſtabliſhed them, upon the erroneous principle that there can be no ſecretion without glands, experience ſhews that there are none; and that thoſe who have pretended that there were, have only ſaid ſo, becauſe they thought there muſt be ſuch; not becauſe they had ever ſeen any there. The tonſils in the fauces, the mucoſe glands in the pituitary membrane of the noſtrils, and the ceruminoſe glands of the ears, are alſo to be mentioned here, tho' all deſcribed already in their places.

383. The principal gland of the neck is the thyroides: this is very large, and has been very indifferently figured, and as ill deſcribed, by Verheyen. In the ſeventh century of the German Ephemerides it is deſcribed at large, and figured,

together with the bronchial glands, in its natural ſize. As much as we could have room for, in a compendium of this kind, has alſo been ſaid of it in its place, in the courſe of this work. We may add, in this place, that this gland in human ſubjects is ſingle, not double: it reſembles the figure of a new moon, or creſcent, the horns running on each ſide upwards, not downwards, as Verheyen has figured them, and adhering to the thyroide and cricoide cartilages, as well as to the œſophagus: its middle part, which is called by authors its iſthmus, is joined to the upper cartilages of the aſpera arteria *.

384. In the memoir referred to, on the ſubject of this gland, in the Ephemerides, the new uſe which Vercellonius † has aſcribed to it is conſidered: he makes it a kind of nidus for what he calls ovula verminoſa; and ſuppoſes that theſe ovula, which are generated in this gland, are diſcharged thro' paſſages, which however neither himſelf nor any body elſe have ever been able to find, into the œſophagus, and thence into the ſtomach; where their buſineſs is, as he expreſſes it, to impreſs a vital character on the chyle, and to promote digeſtion. Theſe ovula, he ſays, alſo often, by accident, hatch into a kind of little worms in the ſubſtance of the gland itſelf; but that this is not the natural courſe.

385. Frequent examinations of this part in human ſubjects, have not been able to confirm the anatomiſt in the truth of the aſſertions on which this ſtrange doctrine of Vercellonius is founded: there are found, indeed, fibres manifeſt enough, by which it adheres to the œſophagus,

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* See Morgagni's Adverſ. T. 1. and Cant's Figura Cordis, T. 4. but diſſection does not always ſhew us the figures.

† See his Diſſert. de Glandul. Conglomeratis œſophagi.

and the gland is always found hard and firm; but the ovula, that this author deſcribes, were never found by any body elſe in it, any more than the paſſages by which they ſhould be conveyed into the œſophagus.

In a diſſection of a female ſubject at Altorff, this gland was once found turgid, and full of a fluid: from this there was a promiſe of ſome diſcovery that might be made, as to its uſe. The trachea and œſophagus were carefully opened with this intent from behind, that a proper examination might be made of their cavities in the parts concerned: after this the gland was preſſed with the hands, at firſt gently, and afterwards more forcibly, in hope of occaſioning ſome of its contents to be evacuated into the trachea or œſophagus, or both; but all the preſſure that could be employed, however varied, was not of power to force one drop of it into either. It is ſtill, therefore, a doubt what the purpoſe for which this gland is deſtined is, and into what part it is that it naturally diſcharges its ſecretions. On opening the gland, it was found to be full of a clear limpid fluid, in which there ſwam a great number of yellowiſh veſicles, or ſpherules, in manner of drops of oil, on the ſurface. Whether theſe were the bodies which Vercelloni had ſometime found in the gland in this ſtate, is not eaſy to determine: they have not the appearance of what he deſcribes under that name, nor indeed are they found once in a thouſand diſſections.

386. Beſide this gland, there are alſo found in the neck a great number of other leſſer ones, diſtributed here and there among the muſcles and fat. Their figure, their number, and their ſituation, vary in different ſubjects; but, in general, thoſe in the anterior part of the neck are called

jugulares, and thoſe in the hinder part occipitales and cervicales. The uſe of theſe is hitherto as uncertain as that of the gland laſt deſcribed: it is generally ſuppoſed, that they are of ſervice to the lymphatick veſſels; but what ſort of uſe they can be of to them, does not ſo eaſily appear.

Ruyſch and Morgagni have alſo deſcribed and figured glands in the epiglottis; and Morgagni has deſcribed others in the other parts of the larynx, particularly about the arytænoide cartilages, as alſo in the trachea; but theſe are often ſo ſmall, that they are ſcarce diſcoverable on diſſection. From the figures of Morgagni * it appears, that he had ſeen them in ſubjects where they were much larger than they are in the generality of mankind: a curious anatomiſt, however, will always find the traces at leaſt of them in all ſubjects.

The œſophagus, eſpecially toward its upper part, has a great number of glands: they have been well figured by Valſalva †. They are in ſome ſubjects, however, found much larger than he has figured them; and, in this caſe, it is frequent to find a little aperture or oſculum in the centre of each, which has much the appearance of an excretory duct.

387. In the thorax we firſt meet with the gland thymus: this has been already deſcribed in its place, where we treated of the thorax; and in our fourth plate there are two figures of it, at number 14 and 15. Bidloo and Verheyen have had long controverſies on the ſubject of this gland. Bidloo, in a diſſertation expreſly on the ſubject, publiſhed at Leyden, very ſeverely attacks the

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* See De Aure human. T. 5. fig. 2.

† See Ephemerides Germ. Cent. 7 and 8, T. 6; but the figures are not well done.

deſcription and figure that Verheyen had given of it. Verheyen has anſwered him with the ſame ſpirit and warmth; and Bidloo replied in another diſſertation; which Verheyen attacked, ſoon after it was publiſhed, in the ſame manner again. Bidloo, at length, fairly quitted the ſubject of the diſpute, and bent the force of his cenſures againſt ſome inaccuracies in Verheyen's Latin; ſo that very little publick utility was the conſequence of this violent paper-war.

388. In the thorax we alſo meet with the glandulæ bronchiales, deſcribed alſo before in their place. Theſe are very obſerveable glands, ſituated externally in the larger diviſions of the trachea and bronchia *. They are of a blackiſh colour; and their uſe, like that of many other of the glands of this part of the body, is yet very little known. It had been long ſuppoſed that they ſerved to ſecrete a liquid, which they diſcharged into the bronchia, for the lubricating and moiſtening thoſe parts: but Vercellonius will have it, that they ſecrete a fluid, whoſe uſe is to be aſſiſtant in the digeſtion of our food; and that they diſcharge it into the œſophagus, thro' certain extremely minute ducts. He obſerves, that the glands are fixed to the œſophagus in a very firm manner, which is true: diſſection never fails to ſhew the fibres by which they adhere; but the ducts, thro' which he ſuppoſes the fluid ſecreted by them to paſs into the œſophagus, and ſo into the ſtomach, have not yet been diſcovered: the fibres, tho' not very minute, are however not thick enough to be ſuppoſed ducts; nor has any body been able to find cavities in them, or to introduce but the fineſt hair into them.

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* See Ephem. Germ. Cent. 8.

Stones, equal in ſize to the laſt joint of the little finger, have ſometimes been found in the largeſt of theſe glands; but this is an accident that very rarely happens. Sometimes black glands of this kind are found adhering to the whole poſterior ſurface of the trachea, near the œſophagus, and ſome of them about its anterior part. They are in ſize from that of a grain of wheat to that of a kidney-bean, and they uſually are affixed looſely to the trachea.

389. About the fifth vertebra of the back there is ſometimes found in the thorax a remarkable gland, adhering to the poſterior part of the œſophagus. It has been deſcribed and figured by Veſalius and others, and is uſually called glandula dorſalis. It is, in different ſubjects, of very various ſizes: it is often of the ſize of a kidney-bean, ſometimes of that of an almond, and ſometimes it conſiderably exceeds the largeſt of theſe ſtandards; at others it is much leſs than the ſmaller, and ſometimes it is wholly wanting, or at leaſt is ſo extremely minute and inconſiderable, that the beſt diſſecters are not able to find it. Sometimes alſo two glands are found in this part, in the place of one: there are not wanting authors who affirm, that it is more frequent to meet with two than with only one; but experience does not warrant this. In the diſſection of a man who died, from an inability to ſwallow any thing, either ſolid or liquid, this gland was found ſwelled to the bigneſs of a hen's egg. The man had complained that the obſtruction was in his breaſt, not in his throat; and it proved, that this ſwelled gland had preſſed one ſide of the œſophagus ſo cloſe to the other, that nothing could paſs, and in this manner had abſolutely ſtarved him. Other inſtances have been of obſtructions of the ſame

kind, under which people have died; but the want of leave to open the bodies, has prevented the informing the world whether this was or was not the cauſe; but moſt probably, in moſt ſuch obſtructions, where the cauſe is perceived to be deep in the breaſt, it is. Verheyen gives us an inſtance of the ſides of the œſophagus intirely coaleſcing, or growing together, from the ſame cauſe *.

390. Vercellonius † is of opinion, that this gland is alſo placed there for the ſecretion of a fluid, ſerving to aſſiſt the digeſtion of our food in the ſtomach. He ſays, that there are ducts carrying this fluid from it into the œſophagus; but theſe ducts do not appear upon diſſection, tho' ever ſo carefully ſought after. Fantonus ‡, and ſome others alſo before Vercellonius, have ſuppoſed that theſe glands diſcharged a fluid of a mucous nature into the cavity of the œſophagus; and Fantonus goes ſo far as to ſay, that he had diſcovered the ducts thro' which it was diſcharged, in the diſſection of a dog; and even alledges, that he had found the worms, mentioned by ſome other authors, living within them. Morgagni § alſo ſays, that in dogs theſe glands are ſometimes found tumid, and inhabited by numbers of oblong and ſlender red worms. Redi ‖ alſo, and Clerk ¶, affirm the ſame; and Morgagni adds, that in this caſe there are alſo found paſſages from the glands into the cavity of the œſophagus; but he acknowledges, that while

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* Anat. Cap. de œſophag.

† See the ſame diſſertation.

‡ Anat. Corp. hum. diſſert. 3. p. 55.

§ Adverſar. Anatom. 3. p. 5.

‖ See his De Animal. vivent. in viventib. repertis.

¶ See De lumbrico lato, cap. 13.

the glands themſelves are in their natural ſtate, there are no ſuch paſſages to be diſcovered in dogs any more than there are in men. Why it is that worms ſhould breed in theſe glands ſo frequently, as by the teſtimonies of theſe authors they appear to do, is very difficult to account for. What Vercellonius ſays of a nidus of ovula verminoſa in the thyroide gland, ſeems, at leaſt, as applicable to theſe.

391. In the abdomen there are very conſiderable numbers of glands: the largeſt of them is the pancreas, already deſcribed: after this, in ſize, come the glandulæ renales, or capſulæ atrabilariæ: after theſe the meſeriacs, and the inteſtinals of Brunner and of Peyer in the inteſtines. All theſe alſo have been already deſcribed.

The glands of the ſtomach are very eaſily diſtinguiſhable in dogs, and in hogs; but in human ſubjects it is difficult to find them: many anatomiſts have doubted them. Morgagni, however, diſcovered them ſo fairly in human ſubjects, and communicated his diſcoveries ſo candidly to the other anatomiſts, that there was no doubt left about them; and frequent obſervations afterwards confirmed the truth of what he aſſerted: they are indeed uſually ſmall; but ſome ſubjects ſhew them ſo large and fair, that it is impoſſible for an experienced anatomiſt to miſs them.

About the vertebra of the loins, near where the receptaculum chyli is ſituated, and about the os ſacrum and the diviſions of the iliac veſſels, there are many glands of various ſizes and figures: they are commonly called lumbares, ſacræ, and iliacæ; and they have numerous lymphaticks entering into them, and diſcharging their contents into the receptaculum chyli.

The lumbar glands have been ſometimes found ſwelled to the bigneſs of a man's fiſt. Women who have been in an apparent ſtate of health, and young men who have died in atrophies, have furniſhed inſtances of this extraordinary growth of theſe glands.

In the concave part of the liver, about the ingreſs of the vena portæ, and the neck of the gall-bladder, as alſo about the ſpleen, near the ingreſs of the veſſels, there are frequently found conglobate glands, of about the bigneſs of a kidney-bean: theſe are called by authors hepatick glands, cyſtick glands, and by other names formed from the names of the parts they are near, and they ſeem to ſerve the lymphatick veſſels.

In the liver of an ox there are uſually a much greater number of theſe glands than in that of a human ſubject: ſome of them are of the bigneſs of a nut, ſome larger, and ſome of them ſometimes are not ſmaller than a hen's egg.

About the left orifice of the ſtomach there ſometimes alſo is found, according to Vercellonius, a gland: he has deſcribed it as equal to a kidney-bean in ſize, and ſays it has ducts opening into the cavity of the ſtomach *. In hogs this gland is very conſpicuous; but a number of human ſubjects may be examined before it is found.

Many authors have told us, that in the omentum, in every part where the fat lies, there are a number of glands, whoſe office it is to ſecrete it. Diſſection ſhews us a few about that part, where it is joined to the pylorus; and as to the reſt, it is not neceſſary that there ſhould be arte-

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* See the place laſt quoted.

† Hippocrates ſays a great deal of the glands of the epiploon in his book of the glands; but he ſeems to have meant the meſentery by the epiploon.

ries, becauſe there is fat; for that may be, and is indeed, in great abundance, ſecreted immediately from the arteries.

In the gall-bladders of oxen there are often found a number of ſmall glands, of a yellow colour, and not unlike the ceruminous glands in the auditory paſſage. In human ſubjects the ſame kind of glands alſo ſometimes are found, but not univerſally *. The bladder and the ureters have alſo ſometimes a number of ſmall glands; but they are very indeterminate in number and ſize, and are not always found indeed in the ſame place, eſpecially about the ureters. Thoſe about the bladder are uſually ſituated towards the neck of it, and are ſometimes tolerably conſpicuous; but more uſually it is much otherwiſe.

392. In the parts of generation of man there occur, firſt, the glandulæ Cowperi, already deſcribed. 2. The glandulæ Littri. And, 3. The odoriferous glands of Tyſon, all deſcribed alſo in their place, with the part they belong to. As to the latter ones, thoſe of them which are ſituated in the interior part of the prepuce, are much more obvious than thoſe about the corona penis, where it is very difficult to diſtinguiſh them from the nervous papillæ of the ſame part. 4. We meet with the proſtatæ. 5. The glands of the veſiculæ ſeminales; but theſe rarely are ſeen diſtinct and fair: ſometimes however they are met with, of the ſize of a grain of muſtard-ſeed, and much of the ſame ſhape. Harder † ſays, that he has ſometimes met with them ſo large, and with an excretory foraminulum ſo conſpicuous in each, that he could introduce a hair into them. He ſays they are equal, in this ſtate, to the largeſt

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* See Ephemerid. Germ. Cent. 5 and 6.

† See his Prodromus Phyſiologicus.

gland of the inteſtina craſſa, or large guts. Terraneus alſo deſcribes ſix ſmall glands in the urethra virilis *: he ſays they adhere to different parts of the cavernous part of the urethra, and that they perforate the ſurface of the urethra, and diſcharge into it a ſoft mucous fluid: it is not eaſy, however, to find any of theſe in diſſection. We may ſometimes indeed ſee, according to the accurate deſcription of Morgagni, certain foraminula in this part, which, from the retention of a fluid in them, will become turgid, and reſemble whitiſh round glands †.

The teſticles, with the epididymides, have been by many accounted glands; but, according to the diſtinctions eſtabliſhed in the firſt part of this Adenology, they are to be wholly excluded from the number of the glands, ſince they are manifeſtly vaſculous, and want the peculiar habit and external appearance of glands; and the antients have all agreed in excluding them from the number of thoſe parts.

393. In the parts of generation in women we are to refer to the number of the glands: 1. Thoſe which Morgagni diſcovered in the nymphæ, which he has very accurately deſcribed ‡. Theſe have a very near alliance with the glandulæ odoriferæ of the penis in men. We are to obſerve, however, that theſe glands are not ſo large and conſpicuous as he has figured them, in all ſubjects; but this is the leſs wonderful, as even the nymphæ themſelves are very different in their ſize in different ſubjects: where the nymphæ are themſelves very ſmall, theſe glands are ſcarce large enough to be viſible; but, on the other hand, in ſubjects in

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* See his Tract. de Glandulis, p. 32.

† Adverſ. Anat. prim. §. 10.

‡ Adverſar. Anat. 1. T. 3.

which the nymphæ are large, theſe glands are very large alſo: in theſe they are often met with fully as large as Morgagni has figured them in the others: they are ſo minute, that none but a very good anatomiſt would be able to diſcover them. 2. Authors tell us of glands in the female as well as in the male urethra; but the diſſecter will find only little foramina and ducts in the place of them. 3. About the extremity of the urethra, however, in the vagina, where there are manifeſt lacunæ, or openings, ſome of them admitting a hog's briſtle, there are ſometimes found evident glands, ſituate beneath them: Morgagni deſcribes and figures one of theſe very large and fair †. Theſe, as well as the glands of the nymphæ, are often very turgid in the time of parturition, and are eaſily diſtinguiſhed by the operator, who is employed in turning the fœtus, or otherwiſe aſſiſting in croſs-deliveries. At this time the copious afflux of blood to theſe parts diſtends them, and they are vaſtly more obvious than in a dead body; ſo that, in diſſections, ſometimes not only the glands but the very ducts themſelves, are not to be found. 4. The veſicles, ſometimes met with near the internal orifice of the uterus, and taken by ſome for a new ovary, appear alſo much more plainly in the time of labour than under any other circumſtances: they are not however properly glands, tho' ſome people have been very poſitive that they were ſuch. They have nothing of the habit and peculiar appearance of glands; and, as they are truly veſicles, the allowing them to be glands would not only be improper in itſelf, but would

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* See Bidloo's Anat. T. 51. fig. 3. and Terraneus de gland. p. 44.

† See Morgagni's Adverſ. 1.

would be the occaſion of confounding two ſo very different things as veſicles and glands. Theſe different parts were always diſtinguiſhed under different names by the antients, and they are not at this time to be confounded together; otherwiſe the ovaries, and other veſiculoſe parts, will have the ſame right to be transformed into glands, in our accounts of them. 5. Some have eſtabliſhed it alſo, that there are glands in the uterus, by which the menſtrual diſcharges are ſecreted. Littri has taken great pains to prove this, in the Memoirs of the Paris Academy: but this has not ariſen from his ſeeing any ſuch glands; for there are none ſuch; neither has he attempted to deſcribe their ſhape, ſtructure, or appearance: he only argues from the falſe hypotheſis, that where there are no glands there can be no ſecretion; and therefore declares, that there are glands in the uterus, becauſe it appears neceſſary to him that there ſhould be ſuch.

394. Many authors have alſo aſſerted, that there are glands in the placenta: it ſeems to have been from the ſame ſource of falſe reaſoning with the former, that this was firſt aſſerted; and many at preſent, not knowing why it was firſt aſſerted, continue, tho' the error in the argument is exploded, to believe that the glands are there. No author whatever has ever ſo much as attempted to demonſtrate theſe glands, or even to deſcribe their ſize, figure, or ſituation. On the contrary, Ruyſch, who has treated of the placenta in many of his writings, and Rauholt *, who has publiſhed largely upon it in the Memoirs of the Paris Academy, mention nothing of glands in it; nor have the moſt accurate examinations of the part been

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* See the Memoirs of the Paris Academy 1714, 1715, and 1718.

able to ſhew any; but the concurrent teſtimony of all the anatomiſts of note in this preſent age, as well as in the laſt, prove that this part is compoſed merely of blood-veſſels.

395. Among the glands which belong to the articulations, and the extremities, we are to mention, 1. The axillary ones: theſe are ſituated under the alæ, and are enveloped in fat, and lie cloſe by the axillary veſſels. 2. The inquinal glands: theſe are ſituated on each ſide in the groin, near the crural veſſels: theſe, in various diſeaſes, are apt to become tumid and inflamed. Abſceſſes are often formed in them, and ſometimes they become ſchirrous and incurable. Their uſe in the body is not eaſily underſtood. 3. The glands, called, from their diſcoverer, glandulæ Haverianæ *, in the articulations: theſe are alſo called, from the matter they ſecrete, glandulæ mucoſæ. Theſe are obſerved in the articulations of the bones; but no where ſo diſtinctly as in thoſe of the femur, as well where it is joined to the acetabulum of the oſſa innominata, as where it is articulated with the tibia. The ſame kind of glands are, indeed, found in the other articulations; but they are greatly ſmaller in them all than in thoſe.

Theſe are the ſofteſt of all the glands in the body: they ſecrete a mucous ſoft fluid, which ſerves to lubricate the joints, and render their motions eaſy, and to prevent their growing dry and cohering together. Theſe glands greatly approach to the nature of a certain ſoft kind of fat, ſuch as is found in the interſtices of ſome of the muſcles, and in the cavities of the ſpine about the marrow; ſo that there, in many caſes, appears reaſon to doubt whether what we call glands, in

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* Theſe are deſcribed in Havers's Oſteology.

this caſe, are truly ſuch; or whether what we take for ſuch is not a more lax and ſubtile pinguedo, or fatty matter, than is met with in many other parts.

About the ſcapula, the flexure of the elbow, the hand, the knee, and the foot, there are alſo found here and there ſome ſmall glands, as alſo in ſome places between and among the muſcles: but as their number and ſituation, as well as their ſize and figure, are very uncertain and variable, it is not neceſſary to recount them in a work of this kind.

396. We are, however, yet to ſpeak of the cutaneous glands. Verheyen tells us, that Steno had diſcovered that there was a gland ſituated under every diſtinct pore of the ſkin; from whence there aroſe a veſſel for the conveyance of the matter of ſweat, which terminated at the ſurface of the cutis: and hence Verheyen, tho' he does not ſay that he had ever ſeen any of theſe glands himſelf, ventures to give them a place among the parts he deſcribes, and calls them ſubcutaneous glands. The pores of the ſkin are ſo extremely numerous, that if, according to theſe authors, there were a gland belonging to every one of them, they muſt be almoſt infinite alſo in number. But in diſſection, when the cutis has been carefully cleared from the fat that is under it, it is certain, that no glands are ſeen either in the ſeparated fat, or on the lower ſurface of the cutis: there are, indeed, always found little portions of the fat here and there, inſinuating themſelves into the little foveolæ, or holes in the cutis: theſe have impoſed upon many young anatomiſts, and been taken for glands; and, indeed, ſome profeſſors have ſhewn them in their lectures under the name of glands: but pieces of fat will always be diſ-

tinguiſhed from glands, with very little difficulty, by an experienced anatomiſt. From this and from innumerable ſearches after theſe glands, made without any ſucceſs, it appears, that there are indeed no ſuch glands as thoſe called ſubcutaneous by theſe authors, that is, glands, one of which is ſituated under every pore of the ſkin; and, in all probability, the ſuppoſed exiſtence of them ariſe merely from the erroneous opinion before exploded, that where there is a ſecretion, there muſt be a gland. Thus, while Steno and others were very ſenſible that there was a ſecretion made at every pore of the ſkin, it was eaſy for them, while they believed the principle juſt cited to be a true one, to take it for granted that there muſt alſo be a gland under every pore.

In the cutis itſelf, and ſometimes in its exterior ſuperficies, under the epidermis, there are, in ſeveral parts of the body, found a kind of ſpheroidal corpuſcles, each with its excretory duct: theſe are particularly frequent in the noſe, the eyebrows, the ears, the nipples, under the armpits, and in the cutis of the penis, the ſcrotum, the pudenda of women, and about the anus. Theſe are bodies of a peculiar kind; but, if they are to be eſtabliſhed on the footing of glands, they are by no means what theſe authors mean by their deſcriptions; neither are they to be called ſubcutaneous glands, as theirs are named, ſince it is evident that they are not ſituated under the cutis, but in it.

397. It may be proper, however, to conſider theſe bodies a little more nicely. We are to obſerve, that they are very indeterminate in their number and ſize, being in ſome ſubjects, much larger, in others much ſmaller, in ſome very numerous, in others few. The noſe and the eye-

lids in ſome perſons are full of them, and have them of the ſize of millet-ſeeds: in this caſe the parts are rendered quite rough and ſeabrous with them, and they occaſion a very great deformity in the face: in others they are very few, and ſo minute as to be ſcarce viſible. The cutis of the penis, and ſcrotum, in the ſame manner in ſome abounds with vaſt numbers of them: in ſome other perſons the ſame parts have ſcarce one, or not one of any ſize on them. We ſeldom alſo find them of any conſiderable bigneſs in the areolæ of the breaſts *: but Morgagni has figured them large there, and an author of his accuracy is not to be ſuſpected of having given them otherwiſe than as he found them. From this it appears, that they vary extremely in different ſubjects, in the ſame parts of the body.

There appears alſo great reaſon to doubt whether theſe bodies are really and truly glands, or whether they are not more properly no other than certain excretory ducts from the arteries of the ſkin, which, either from the denſity of the cuticle in thoſe parts, or from the thickneſs of the matter contained in them, become obſtructed, and are ſo formed into theſe large tubercles. Ruyſch and Boerhaave † are clearly of this opinion in regard to them, and therefore call them not glands, but crypta, folliculi, and receptacula cutanea. Vercellonius is alſo of the ſame opinion, as appears from his ſaying ‡ that the ſebaceous glands, for that is the name given by the modern anatomiſts to theſe tubercles, are no other than the mere extremities of the arteriolæ of the cutis, expanded into a kind of follicles, or little bags. Bianchus

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* Adverſar. Anat. prim. T. 4. fig. 2.
† Ruyſch's Adverſ. Anat. Dec. 1. p. 9.
‡ Diſſert. de Gland. conglomerat. œſophag. p. 150.

is clearly of the ſame opinion alſo, and aſſerts, that the cutaneous glands of many authors are parts which do not exiſt, nor are at all neceſſary to the ſecretions performed in that part*.

Reaſon joins with theſe authorities in declaring, that theſe globoſe particles are not truly glands, becauſe, firſt, they are wholly wanting, in many ſubjects, in the places where in others they are ſo extremely numerous. 2. Becauſe, when the ſtagnant, viſcid, or ſebaceous matter contained in them is preſſed out, as is eaſily done between the fingers, the whole tubercle diſappears, and the part is loſt to the ſenſes; which could not happen, if the tubercle were a real gland, or congeries of veſſels arranged in their determinate manner, and incloſed in their proper membrane: tho', if all the contents of the gland were to be ſqueezed out, in this caſe the veſſels and the membrane would certainly remain, and the part would continue viſible. Upon the whole, the doctrine of the glands ſeems hitherto eſtabliſhed upon the leaſt firm and certain footing of that of any of the parts of the body; and it is much to be wiſhed, that the preſent ſet of anatomiſts, than whom there perhaps never was a better, would ſet themſelves heartily to work to eſtabliſh a better ſyſtem, and better diſtinctions of theſe parts, than are to be found at preſent.

398. The doctrine of the glands eſtabliſhed in this work, as it is clear and perſpicuous, and is conſonant to the opinions of the antients, and not diſagreeing with the common received opinion, as to the nature and ſtructure of the glands, has been very well received by many of the modern anatomiſts in the former editions of this work; and a French phyſician, in particular, has thought ſo

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* In Hepatis Hiſtoria.

well of it as to tranſlate it *verbatim* into his own language, and make it a part of his ſyſtem of anatomy *: nor indeed has any body ſtood up againſt it, except Michelotti in his treatiſe of the ſeparation of the fluids in animal bodies. This author ſays, he does not know what is meant by that peculiar habit and appearance of a gland, which is laid down in this place as one of the great characteriſticks of thoſe bodies. But not only people, who have not ſtudied anatomy certainty, do know a gland, when they ſee it, by its external peculiar appearance and habit, without having been obliged to books, definitions, and deſcriptions for their knowledge; but even Michelotti himſelf plainly enough declares, that he was not blind to this peculiar habit of the glands, when he tells us, that he ſhall readily agree in regard to the larger glands, and to ſome indeed of the ſmaller alſo, that they may be known by their peculiar appearance, or external habit. This, ſurely, does not accuſe the deſcription given of a gland, in this work, of quite ſo much obſcurity, as his not underſtanding what was meant by our term *peculiar habit* did before.

He agrees alſo with the doctrines eſtabliſhed here in this, that he allows all the ſecretions or ſeparations of fluids in an animal body, are not performed by means of glands, with veſicles or follicles in them, as the more rigid followers of Malpighi pretend: he expreſly ſays; "I agree "with Heiſter, that the ſeparations of fluids in "animal bodies may be and are, in many of the "parts, actually made without the intervention "of follicles or veſicles;" but he proceeds to affirm, that the eſſential and peculiar ſecret ſtructure of the glands, and particularly of the more minute ones, is not to be diſtinguiſhed by any peculiar external appearance or habit, but by their peculiar vaſcular ſtructure and compages, which is contrived in a ſingular manner, appropriated to their neceſſary offices: and from hence he concludes, that the cortical ſubſtance of the brain, and the ultimate vaſculous parts of the liver, the ſpleen, and the teſticles, ought to be referred to the number of what are properly called glands.

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* Noguez Anatom. de Corps humaine, Paris 1723.

This, however ſpecious it may appear, we cannot but obſerve has been already fairly anſwered in the courſe of this part of this compendium, where it has been ſhewn, that an inexplicable confuſion of the different parts of the body would be the conſequence of the taking away that long eſtabliſhed diſtinction between the vaſculous and the glandulous parts, which has exiſted ſo many ages, ſerved to ſo many diſtinctions with ſufficient accuracy, and is obvious to the very ſenſes in the inſpection of the parts. Every part of the body may be called a gland, if ſo large and vague a characteriſtick of glands be eſtabliſhed: while we would ſpeak intelligibly and diſtinctly, we muſt call every thing by its diſtinctive name.

Michelotti, from his idea of a gland, which he makes to conſiſt in the being merely a vaſcular part, does not blame thoſe who aſſert, that wherever there is a ſecretion performed, there muſt be a gland: but this, beſide being in itſelf a perfectly erroneous aſſertion, leads, and has at all times led, the aſſerters of it into ſuch a ſeries of errors, that it is not eaſy to ſay what could be a more unlucky maxim in anatomy. The chyle is evidently ſecreted in the inteſtines, without the aſſiſtance of glands. The fat is alſo ſecreted without them; and ſo is as evidently the mucus in the pituitary ſinus's, the ſemen in the vaſculous compages of the teſticles, and the menſtrual blood in the uterus. All the membranes, nay, in ſhort, every part almoſt of the body, would be intitled to the name of a gland upon this plan; which can neither agree with the ſenſe of the antients, with the ſtructure of the parts, or with the opinion that the generality of the world, as well thoſe who have ſtudied anatomy as thoſe who have not, have eſtabliſhed within themſelves of what a gland really is. All the world agrees in certain general ideas of what a gland, what a muſcle, what a membrane, what a veſſel, what fat, or what an inteſtine is, and by theſe ideas they can diſtinguiſh theſe parts when they ſee them; but all this means of diſtinction would be taken away, by thus confounding vaſcular and glandular parts. The ten Latin lines made occaſionally in honour of a young phyſician ſuſtaining a theſis on this ſubject, ſome time ago, are yet too juſtly applicable to the ſubject:

Dicere difficile eſt medicis, quæ glandula pars ſit;
Nondum doctores haud docuere ſatis.
Corporis hinc omnes mire confundere partes
Cœperunt, & pars glandula quævis erat.
Nunc quivis plexus vaſorum glandula dictus;
Nunc membrana omnis glandula facta fuit.
Mox cerebrum, ſplen, pulmo, jecur, reneſq; vocati
Glandulæ; nunc quævis bullula talis erat.
Aſt qui diſtinguit partes, quas viſus & uſus
Diſtinguunt priſcus, rectius ille docet.

Wherefore, tho' it is eſtabliſhed in the doctrine of a gland here delivered, that its inmoſt ſtructure is truly vaſcular; yet as there are a multitude of parts that are truly vaſcular, which cannot be called glands, without making too free with the diſtinctions nature has herſelf eſtabliſhed, and mankind in general, 'till the time of Malpighi, had acquieſced in; it has been a principal point eſtabliſhed here, that for a part to be veſiculoſe and vaſcular does not conſtitute it a gland: and as neither the office of ſecretion, nor any other character hitherto diſcovered, is ſufficient to diſtinguiſh accurately, and with certainty, thoſe parts which the antients called glands, and which the generality of writers ſince their time have alſo agreed in calling ſo, it appears neceſſary, as well as proper, 'till ſufficient diſtinctions of a more accurate kind can be eſtabliſhed, to call in, as is here done, that peculiar external appearance and habit of a gland, which has always hitherto ſerved to diſtinguiſh them from other parts. And upon theſe principles it probably is that Nicolai, in his diſſertation De Directione Vaſorum, has ventured to aſſert, that Michelotti's hypotheſis of the glands is precarious.

399. Boerhaave, in a long epiſtle to Ruyſch, has ſaid a great deal in favour of the Malpighian ſyſtem of the glands, and which conſequently makes againſt what is advanced on the ſubject in this work; but even the name of Boerhaave cannot, in juſtice, be ſuppoſed to overthrow reaſons, 'till better reaſons are eſtabliſhed in the place of them. Ruyſch and Boerhaave had many arguments on the ſubject of the glands, managed with a friendly moderation, and yet carried to the exacteſt ſcrutiny: Ruyſch was poſitive in his own opinions, Boerhaave favoured thoſe of Malpighi; and it was, in fine, agreed between them, that this epiſtle of Boerhaave's ſhould contain all that its author had to urge in favour of the Malpighian ſyſtem; and that, after this, Ruyſch was to publiſh his reaſons againſt it, to urge all that he

could to overthrow the ſyſtem, and to ſupport his own. Both theſe treatiſes were afterwards publiſhed under the title of an Opuſculum Anatomicum de fabrica glandularum in Corpore humano *. In the firſt, Boerhaave, with all that ſtrength of reaſoning he was maſter of, produced all the arguments that could be alledged in favour of the Malpighian ſyſtem; tho', as himſelf candidly confeſſes, he, in many things, differs much leſs in his real ſentiments from Ruyſch than the neceſſary form of argument makes his words ſeem to import. Ruyſch has anſwered all theſe arguments in a nervous and ſtrong manner; but as it appears, that, beſide all that Ruyſch has advanced, there are ſtill many arguments behind, that greatly make againſt the Malpighian ſyſtem, it is not proper they ſhould be paſſed over in ſilence. What Ruyſch, therefore, from his great age, his many avocations, and a thouſand other reaſons, omitted, we ſhall, with all due deference to ſo honoured and ſo truly honourable a name as that of Boerhaave, (not for the ſake of diſpute or cavil, but in the honeſt purſuit of truth) venture to give here.

Malpighi and his followers, not excepting even Michelotti, have eſtabliſhed it as a ſtanding maxim, that every gland has a follicle or veſicle within it: but Boerhaave, who has attempted, with more labour and ſtrength of genius than any other author ever did, or probably ever will do, to ſupport the Malpighian hypotheſis, if ſupportable, ſeems in this eſſential point to diſagree with the author of the ſyſtem, and with all his followers; for he defines a gland to be a very ſimple part, which properly forms an involucrum, or caſe, with the ſimple apparatus of a membrane,

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* Publiſhed at Leyden in 1722, in 4to.

within which a peculiar liquor is ſecreted. An involucrum or caſe is, as all the world muſt agree, nothing more than a covering; and it muſt be as readily allowed, that the integument of a part is not the part itſelf, as the integument or involucrum of the liver is not the liver itſelf; and, in the ſame manner, the involucrum of a gland is not that gland itſelf; nor can this involucrum or integument, forming the caſe of a gland, be ſuppoſed or underſtood as the thing itſelf, without manifeſt confuſion.

If it be alledged, that Boerhaave in this place uſes the word involucrum in a new and appropriated ſenſe, and means by it to expreſs the veſicle or follicle of the Malpighians, we are only to obſerve, that the uſing the word involucrum as ſynonymous with veſicula or folliculus; and as the term to expreſs a gland is giving a ſenſe to it, different from that under which it has been received at all times by the antients, and by the moderns, and indeed giving it a wholly unknown ſignification, by means of which great confuſion muſt be brought into all writings in which it is neceſſary to uſe the terms.

We would be glad to know, what antient Greek or Latin writers, or indeed what author of any age or nation before Malpighi, ever took a veſicle or a follicle for a gland, or ever called ſuch a part by ſuch a name? It is evident, that no one ever did; nor is it leſs evident, that this ſort of innovation, in regard to the ſenſe of words, cannot be brought into uſe without the utmoſt confuſion among the things before underſtood by thoſe words. This is evidently a new way of underſtanding the two words veſicula and glandula, which is not only incongruous to the ideas before affixed to them, but alſo quite unneceſſary.

ceſſary. We are ready to agree with theſe great authors, that there are veſiculæ or folliculi in ſeveral parts of the human body, within the cavities of which fluids of various kinds are ſecreted, contained, retained, changed, and, in fine, from out of the cavity, of which they are diſcharged by a proper paſſage; but there is no reaſon for calling theſe parts glands. The urinary bladder, the gall-bladder, the veſiculæ ſeminales, and the veſiculæ in the ſinus's of the bones of the ſkull, are indiſputably hollow parts, within which peculiar liquors are ſecreted, contained, retained, and changed, and from which they are afterwards excreted; and they have, therefore, all the requiſites for the eſtabliſhing them glands, according to even Boerhaave's definition: but no author of any time, new or old, antient or modern, ever ſuppoſed theſe ſeveral parts to be glands, or ever called or deſired others to call them ſo; but at all times they have been called by their proper, expreſſive, and diſtinct names of veſicæ, or veſiculæ.

From this therefore it is evident, that tho' veſiculæ be clearly demonſtrated to exiſt in certain parts of the body, whether they are neceſſarily and naturally there, as in the cutis; or whether they are found only under certain circumſtances, and appear rather to be the effect of diſtemperatures of the part, not of its natural ſtate: and tho' in theſe ſeveral veſiculæ a peculiar appropriated fluid be proved to be ſecreted there, retained, changed, and finally excreted; yet ſurely it is not proved from all this, that theſe veſiculæ are glands, or that there are any glands in the part where they are found; and therefore the parts where they are found ſhould not be called, as they uſually are, glandulous parts, but veſiculous parts. Theſe veſiculæ are not, nor do they indeed at all reſemble glands; but they are perfectly like the veſiculæ, or veſicæ, already mentioned, as always called by that name; and therefore they ought always to be called by the ſame name, unleſs we are deſirous of introducing into medical writings endleſs confuſion and diſputes about words, which will always lead into errors about things, according to the Latin adage,

Errorum genitrix eſt æquivocatio ſemper.

Where therefore only veſſels are found, let thoſe parts be called vaſcular; where only veſicæ or veſiculæ are found, let thoſe parts be called veſicular: but where glands are found, let thoſe be called glandular, or glands. Thus, in various parts of the ſkin, there are found folliculi or veſiculæ, in which an unctuous liquid is formed, which is always either viſcous or ſebaceous, particularly in the noſe, the ears, &c. as before obſerved: theſe veſiculæ or folliculi are truly veſiculæ, and have no appearance of the nature, ſtructure, or peculiar habit of a gland; they are therefore very improperly called by the name of glands: they may be much more properly called folliculi receptacula, or crypta, as ſome have called them, and moſt properly of all veſiculæ cutaneæ. They have all the requiſites of the veſicæ before mentioned, and indeed ſcarce differ at all from them, except in bigneſs.

Why, therefore, Malpighi and his followers ſhould deny the name of veſicles to theſe, and ſhould impoſe on them another new, improper, and foreign one, not expreſſing their nature, but occaſioning endleſs confuſion, by joining them to another ſet of bodies of a different ſtructure, does not appear.

We have already obſerved, that if there were, in reality, veſicles found in the brain, liver, kidneys, &c. in their natural and healthful ſtate, which yet is a thing much to be diſputed, it would not follow, that theſe viſcera were to be called glandulous in their ſtructure, but veſiculous or veſicular.

Where, indeed, ſuch veſicles are ſurrounded by or incloſed in a quantity of a glandulous fleſh, or of ſuch a ſubſtance as the bodies allowed by all people of all ages to be glands are compoſed of, and which, at firſt ſight, ſhews that peculiar face and habit which characteriſes a gland; in that caſe, as this is the caſe in regard to the glands of the lips *, thoſe of the aſpera arteria †, and thoſe of the palate, the pharynx, the inteſtines, and particularly of the duodenum and rectum, then theſe bodies, tho' veſicular, are to be acknowledged to be true and proper glands. But they are not charactered as glands by the veſicæ within, as the Malpighians aſſert, much leſs by the involucrum, but by their peculiar fleſhy matter ſurrounding the veſicles; for it was from this peculiar fleſhy matter alone, not for any other cauſes, as has been evinced in the preceding parts of this work, that the antients called certain parts of the body glands, or glandular parts. Their names of parts ought by no means to be changed by us, unleſs with very ſufficient reaſon; and conſequently 'till abſolute and diſtinctive characters of what a gland is ſhall be eſtabliſhed, and ſhall be found to exclude ſome of theſe bodies univerſally received as glands, or to take in ſome others not ſo received. Theſe parts, and no other parts but theſe, ought to have the name of glands with

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* See T. 8. fig. 36. d d.

† Morgagni, Adverſ. 1. T. 2. o o.

us: otherwiſe, as has been abundantly proved already, equivocations, and from them confuſions of the ſeveral parts, will be let in upon us, and numberleſs errors are the neceſſary conſequence; all which will be avoided in this caſe, if we will only agree with the antients in calling the bodies which they called glands, and thoſe only, by that name.

400. Finally, we are to add, that thoſe tumors which Boerhaave and Malpighi have declared to be ſituated in the follicles or veſicles of the cutis, as the atheromata, ſteatomata, talpæ, and the like, do not, in our opinion, ariſe in the cutis, but under the cutis: for, in the extirpation of theſe tumors, they do not only appear very evidently, before the operation, to lie under the cutis; but, in the operation itſelf, the cutis muſt always be cut quite thro' before the tumor or its follicle can be got at. Nay, the ſame appears evidently even from the very accounts theſe authors themſelves give of theſe tumors, which had fallen under their own obſervation.

It will appear to every one, from this, how very little all that has been alledged, in regard to theſe encyſted tumors, proves in favour of the doctrine of the cutaneous glands; and how equally little all the other morbid caſes they have recited on this occaſion, tend to prove that there are, in the parts where they have been produced, any ſuch glands as the authors have brought them to ſhew that there were there. In all theſe caſes, the parts have receded too much from their natural ſtructure, to give any grounds for forming a judgment of what is that ſtructure from them: and this argument is alſo of infinitely the leſs weight, toward the proving what theſe authors intended to prove by it, as the true and genuine glands are ſcarce ever changed into hydatides or veſiculæ; but, on the other hand, the vaſculous parts are extremely ſubject to ſuch changes.

Nothing can be a ſtronger inſtance of the truth of this obſervation than that ſingular caſe, recited in another part of this work, of the whole liver being transformed into a multitude of hydatides, in ſuch a manner, that there remained not the leaſt veſtige of the vena portæ, or vena cava. A very ſtriking inſtance of how great changes may be made in the parts by diſtemperatures!

SCHOLION.

It ſeems very evident, that Hippocrates * principally had regard to the general habit of the glands, ſo ſtrongly inſiſted upon in this treatiſe as their great and obvious characteriſtick, in his deſcriptions of them; ſince he ſays, their ſtructure is ſpongy; that they are lax in their texture and fatty; that they are not compoſed of a fleſh, like that of the reſt of the body; nor have, indeed, in them any thing like any other part of the body, but a friable matter, full of a multitude of veſſels.

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* See his Liber de Glandulis.

ADDITIONAL NOTES.

NOTE 76.

THE epidermis, or cuticula, is formed merely by the production of the integuments which are under it. The cutis has a number of wrinkles and furrows, furniſhed with their ſecretory and excretory veſſels, and with cluſters of nerves. Theſe three productions, as they dry, form a kind of ſcales or ſquammæ, and are lodged one upon another. The fluid matter, which exhales by means of the heat from them, then leaves them harder, dryer, and more rigid than they were before; and, under this transformation, they make what we call the epidermis.

This ſyſtem of the origin of the cuticle is perfectly analogous to what the microſcope ſhews us in it; for whatever part of it we examine, with the aſſiſtance of that inſtrument, we find it compoſed of theſe ſquammæ or ſcales; or whatever part of the ſurface of the body be examined, in its healthful ſtate, it is always found thus covered. When any violent attack is made upon the ſurface of the body, theſe ſquammæ are the firſt thing that feel it; and, if not too ſevere, often they are the only part affected by it. Their ſofter part, which remains yet attached to the under integuments, looſes its connection, and the whole ſeries of ſquammæ come off together, in form of a thin ſkin, which is properly the epidermis. As ſoon as this outer integument is off, the furrows and excretory veſſels of the cutis appear: they immediately protrude themſelves again at their extremities, and form a new ſeries of theſe ſquammæ; that is, they conſtitute a new covering for themſelves, a freſh epidermis, like the firſt. If this new-formed epidermis be ſeparated again from the under integuments, a third will be formed in its place, and ſo on, almoſt without end.

From this account of the formation of the cuticle, we may underſtand the nature and origin of calloſities; which are, in reality, no more than a number of ſeries of theſe ſcales, or ſeveral diſtinct epidermis's, laid one upon another. In order to the formation of theſe calloſities it is not neceſſary, however, that the epidermis ſeparate itſelf entirely from the ſkin; for, in this caſe, the effect would be different, and the matter of tranſpiration or ſweat would raiſe it into bliſters, as we ſee in burns: in which caſe the action of the fire hardens the epidermis, and ſeparates it entirely from the ſkin, after which the matter of perſpiration not being able to make its way thro' its altered ſubſtance, and at the ſame time nothing fixing it down to the ſkin, the fluid, which ſhould have been exhaled, is collected in drops, and raiſes the cuticle, lodging itſelf between it and the cutis, and forms the bliſters, which are the conſequences of ſuch accidents.

The veſicles which are formed in exanthemata, without the aſſiſtance of external agents, may alſo be accounted for on the ſame principle. That part of the epidermis, which is naturally immerſed in the larger cavities of the cutis, ſeparates itſelf from the internal ſides of theſe cavities which it before covered, and raiſes itſelf outward, as the fluids from within preſs it that way. As it does not give paſſage ſo readily to theſe fluids as their excretion requires, they cannot but be retained under it, or between it and the cutis, and they muſt there form a kind of bliſters or elevations, which muſt riſe above the level of the ſurface of the ſkin; and when the blood is urged, by the nature of the diſorder, into theſe cavities of the cutis, theſe elevations muſt appear red.

Immediately under this membrane, called the cuticula and epidermis, lies the corpus reticulare. To form to ourſelves an idea of the nature and origin of this, we are to remember, that under the ſkin, and on the ſurface of the membrana adipoſa, there are certain ſeries of nerves which form a kind of membrane, accompanied with arteries, veins, and lymphaticks. Theſe nerves

elevate

elevate themſelves in form of pyramids, and with their heads pierce thro' the cutis; and, when they are arrived at the epidermis, they put off the membrane with which they were before covered: this membrane, or covering of the extremities of the nervous pyramids, when ſeparated from them, divides into a number of lobes, which apply themſelves to the cutis; and there uniting with thoſe others, which are thrown off from the other cluſters of nerves, by this union of the lobes, formed by theſe different ſeparations, there is formed this membrane, called the corpus reticulare. The cluſters of nerves paſs thro' the apertures of this membrane, and run to the two ſides of every one of the furrows of the cutis, where they are arranged into parallel ſeries, in a longitudinal direction, and are the organs of ſenſation; which is more or leſs ſtrong, according to the more or leſs ſtrong motion that is excited in theſe cluſters of nerves. The ſoul, which is preſent in every part, feels the ſlighteſt ſignal from them; and her ſenſations are more or leſs ſtrong and lively, as the motion given to theſe nerves is more or leſs violent; and in conſequence, if any part of this ſtructure is hardened by external accidents, or otherwiſe, ſhe has no more communication or connection with that part, becauſe there cannot any longer be any ſenſations excited in thoſe cluſters of nerves.

Beſide this reticular ſubſtance there is another, which may be called properly enough the rete cutaneum, or rete of the cutis. This is formed by the veſſels which are diſperſed all over the ſkin: theſe veſſels receive, in general, no other fluid but lymph; and to this it is owing, that the whole ſurface of the body with us is white. It has been ſuppoſed, that in negroes this reticular ſubſtance was formed of larger tubes; and from hence authors have argued, that in conſequence of their larger ſize, theſe veſſels may have received blood into them in thoſe ſubjects; and that this blood, diveſted of its lymph and other aqueous matter by tranſpiration, became black in them, and was the occaſion of their black colour. This has a ſhew of reaſon; but we are at preſent very well aſſured, that the black colour of theſe people is ſolely and entirely owing to a black matter,

ter, of a peculiar kind, lodged in the corpus reticulare, tho' we are not acquainted with its origin.

There are people always of a florid red colour, from the blood in the veſſels of the ſkin not being diveſted of its lymph; and in general, according to the nature of the blood and other liquors which enter theſe veſſels, the ſkin is differently coloured. We are not to ſuppoſe it wonderful, that the veſſels of the ſkin are not exactly of the ſame ſize in all people; for we find that they vary extremely, in this particular, in the different parts of the body in the ſame perſon. In the cheeks they are naturally very large, whence there is in general a florid colour there; and the blood being capable of ruſhing more forcibly into them on any occaſion, it is in them that fluſhings of red are firſt ſeen from exerciſe, or a thouſand other occaſions. In many of our paſſions the nervous fluid being forced violently along its paſſages, they preſs upon the arteries, and force the blood into the lateral tubercles which form this reticular ſubſtance: hence it is, that we grow red with theſe paſſions. If the paſſion be more violent ſtill, and the nervous fluid urged on with greater force, the arteries may be ſo preſſed upon as to prevent the blood's paſſing at all along its own little channels; and to this it is owing that we turn pale with extreme anger, and with many other very violent paſſions.

The ſame conſequence will happen alſo, tho' on another principle, if, on the contrary, the nervous fluid is not propelled at all, for want of force in the nerves: in this caſe the heart will not ſend the blood at all into theſe minute veſſels, and conſequently we become pale, as in the other caſe. This is the origin of that paleneſs which ſeizes us in terror.

Under the ſquammæ, or ſcales of the epidermis, we diſcover, by means of the microſcope, a vaſt number of holes or apertures: Lewenhoek tells us, that he reckoned not leſs than a hundred and twenty-five thouſand of theſe, within the ſpace that a grain of ſand would have covered. He ſuppoſed theſe to be the excretory apertures deſtined for perſpiration; but, on the niceſt view, it is hard to determine whether what he called holes and apertures were all truly ſuch, and whether many of them were not extremities of veſſels. We ſee clearly and diſtinctly enough, however, a number of tubercles on the ſurface, which are of conſiderable ſize, and which we can diſtinguiſh to come from certain glandulous bodies, ſituated on the internal ſurface of the cutis. When we examine theſe tubercles on the extremities of the fingers, with the aſſiſtance of good glaſſes, we diſcover that their inner ſurface is punctulated all over with little dots, which are the apertures of other ſmall tubercles. All theſe little apertures, doubtleſs, diſcharge their contents into the general tubercle: theſe contents are the matter of perſpiration and ſweat; and what we had been uſed to eſteem the excretory ducts for it, and think very ſmall ones too, appear truly to be only the reſervoirs of it, running from millions of others ſtill more minute.

NOTE 77.

Gagliardi obſerves that the bones, beſide their hard matter, have a ſpongy, and, as he expreſſes it, a reticular ſubſtance: there is a membrane alſo, which forms the veſicles in their interſtices, as we ſhall ſee more at large below.

The hard matter of the bones is compoſed of a multitude of lamellæ, or flakes, laid in ſeveral ſeries over one another; and, in the long bones, the external ſeries of theſe lamellæ ſeparates itſelf from the others at their extremities: the next ſeries alſo ſeparates itſelf in the ſame manner; but it is ſhorter than the former; and the ſame is to be obſerved in ſucceſſion of all the reſt.

The heads of theſe bones, when cut longitudinally, reſemble a battledore. We ſee by this ſtructure eaſily and naturally, what it is that occaſions the protuberance of the heads of the bones.

The ſpongy ſubſtance of the bones is only an aſſemblage of a multitude of boney lamellæ, which are not diſpoſed evenly over one another, as thoſe of the hard parts, but croſs and interſect one another at various angles, and have ſpaces or cellules between them. It is evidently no other than the hard lamellæ, which, by their different poſition and diſtance, form the ſpongy matter; and hence it is, that we find it in the heads of the long bones.

The

The reticulation, or reticular part, is compoſed of fibres, which croſs and interſect one another: theſe fibres or filaments proceed from the ſpongy ſubſtance among which they are intermingled: they are placed in the cavities of many of the bones, to ſupport the medullary matter in its place.

The interſtices, which are found between the fibres of theſe reticulations, are lined with a membrane which forms veſicles; and it is within theſe veſicles, which in many of the bones reſemble cluſters of grapes in form, that the blood-veſſels depoſite that fatty or oleaginous ſubſtance, which we call marrow.

In the long bones we meet with the three ſubſtances juſt mentioned, the hard, the ſpongy, and the reticular; but in the flat ones we meet with only the two firſt, a hard external matter, and a ſpongy one between: this ſpongy ſubſtance, in the cranium, is what we call the diploë.

There is not, in reality, any of that great difference that there appears at ſight to be, between the hard and the ſpongy ſubſtance of the bones; for, on calcining the very firmeſt bones, we find that their hardeſt and moſt ſolid parts are, in reality, no more than an arrangement of cellules: the whole difference between them therefore is, that in the hard parts an indurated or ſolid matter fills up the cellules; and in the ſpongy parts a ſofter matter is depoſited, which leaves the cavities diſtinctly viſible. The ſame fatty ſubſtance, which occupies the interſtices of the reticular part of the bones, is alſo lodged in the cells of the ſpongy part.

NOTE 78.

Malpighi has very accurately explained the ſtructure of the teeth in thoſe of oxen; but we are not ſo well informed of the ſtructure of thoſe of the human body. They have externally a white matter, harder than the reſt, which is compoſed of perpendicular fibres, raiſed from the ſurface of the internal ſubſtance. This is only a ſeries of little veſſels, in which there is lodged a firm white matter: theſe hardened veſſels are ſometimes continued into the internal ſubſtance of the tooth, which ſeems to be an arrangement of cells, in which the blood, which is ſent from the root of the tooth, circulates: it is eaſy to ſee from this, that the teeth muſt become black, when robbed of this white matter; and they may be diveſted of this either by external accidents or force, or by the ſtagnation of the blood which ought to circulate within, which, after this ſtagnation, grows corrupt, and corrodes the enamel of the teeth. The part of the tooth, which forms what we call the root, is truly boney, according to the obſervations of Dr. Havers: it is compoſed of lamellæ of a boney matter, in the manner of the other bones; and it was alſo neceſſary, for the uſe of the teeth in the comminuting our food, that the enamel or external covering of them ſhould be harder than the reſt.

The teeth have a membrane covering their roots: this is produced from the membrane which covers the gums, and lines the inſide of the mouth. We alſo ſometimes find at the root of a tooth a fleſhy matter, like that of the gums, which ſerves to keep it firmly in its place.

The perioſteum, which covers the maxillary bones, runs down into the alveoli, or ſockets of the teeth; and on one ſide it adheres to the bone of the alveolus, on the other to the root of the tooth: when there is no fleſhy matter in the way, it joins itſelf in ſo firm and perfect a manner to the membrane that covers the roots of the teeth, that it concretes, as it were, into one ſubſtance with it.

The nerves which enter the jaws ſend ramifications alſo to the teeth, in the ſame manner as the blood-veſſels of the ſame bones do. The aperture in which theſe enter is often viſible in the tooth, without the help of the microſcope; but it is not always in the ſame part of it. Sometimes it is at the very point of the root, ſometimes on one ſide of it. It is evident from this, that the teeth are capable of pain; and that odd ſenſation, expreſſed by us by the phraſe *ſetting the teeth on edge*, by biting certain ſubſtances, is alſo eaſily explained by underſtanding the communication we have mentioned, between the membrane of the gums, the perioſteum of the maxillæ, and the roots of the teeth.

The microſcope diſcovers pores of two kinds in the bones, longitudinal and tranſverſe ones. Theſe are not intended to give paſſage to blood-veſſels; but, according to Dr. Havers, the tranſverſe ones are deſtined for the primary reception of the medullary juice, and for the diſtributing it to the longitudinal ones.

NOTE I.

Dr. Trew of Nuremberg, who had attended the author's courſes of anatomy, and diſſected with him for four or five years, deſired him to communicate to the authors of the German Ephemerides ſome anatomical obſervations, which ſtand in the publications of that body for the year 1717, on the ſubject of ſome ſeſamoide bones, which he had diſcovered by his own indefatigable obſervations in bodies diſſected by the author, in the anatomy-ſchool at Altorff. Theſe bones are deſcribed and delineated as new-diſcovered ones in the account, and the author had communicated them as the diſcovery of Dr. Trew, and ſent them in his name. The publiſhers of thoſe works, however, without his knowledge, printed the paper, with ſome few alterations, in his name, not in Dr. Trew's: the author of this treatiſe thinks it incumbent on him to take this publick opportunity of ſetting this matter right, that neither Dr. Trew nor his friends may ſuppoſe him guilty of any attempt to take any thing from the merit of ſo ingenious a man, or of intending to do himſelf honour from the diſcoveries of another: and to give the praiſe where it is due, he here declares, that every thing contained in that account does of right belong to Dr. Trew.

He confeſſes alſo, that he did not know of theſe bones 'till they were ſhewn him by Trew, eſpecially thoſe of the oſſa femorum, and then conſidered them as new-diſcovered ones. Ravius, who had been long preceptor to our author in anatomy, and eſpecially in the oſteological part, had never, as he obſerves, mentioned them in his lectures; but abſolutely declared, in his manuſcript-oſteology, which his pupils had the advantage of looking into, that there were no ſuch bones: he expreſly ſays in that treatiſe, we are to take care not to add improperly to the number of the bones, by counting more than ten of the ſeſamoide ones. There are two of them at the ſecond joint of the thumbs and great toes, and one in each tendon of the muſculus tibialis poſticus *. The articulations of the fingers never have any of them, and it is but very rarely that the tendon juſt mentioned has. It is evident, from this paſſage, that Ravius not only ſays nothing of the ſeſamoide bones of the thigh, and of the little finger; but abſolutely denies the exiſtence of all the other ſeſamoide bones, as they are called, except the ten he particulariſes.

Hornius alſo, in his Microcoſmus, and his Commentators, who have, in general, been men of great knowledge, and many others of the more eminent writers on theſe ſubjects, have omitted the mention of them: Verheyen †, who does mention thoſe in the thigh, yet does not ſpeak upon his own knowledge, but quotes the authority of Bartholine for them. And, finally, Marchettus ‡, a very accurate and diligent diſſecter, declares, that he never could find theſe ſeſamoidæ of the femur, tho' he had, from finding them deſcribed by ſome writers, frequently looked carefully after them. From all this, and from the vain attempts that had been often made by the author himſelf to find them, he wholly gave into the opinion of Ravius, that there were none ſuch: but he was afterwards perfectly convinced by Trew, that there did ſuch bones exiſt; and that ſeveral other oſſa ſeſamoidea alſo were to be found, which were not deſcribed, nay, were excepted againſt by Ravius.

After this, however, looking into a great number of the anatomical writers of moſt credit, on occaſion of theſe bones; and finding, in conſequence of this, that not only one but two ſeſamoide bones had been ſometimes met with, in old ſubjects, in that part of the femur where the gaſtrocnemii have their origin, parti-

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* Probably Ravius intended in this place not the tibialis poſticus, but the reconæus poſticus; for the author, as well as Veſalius and others, have found this bone in that, not in the other.

† See his Anatomy, cap. de Oſſ. Seſamoid.

‡ See his Anatomy, cap. 19. de Muſc. Gaſtrocnemiis.

cularly by Veſalius §, Riolanus ‖, who aſcribes the honour of the firſt diſcovery of them to Veſalius, and alſo by Bartholine *, Munnick †, Drake ‡, and others; and that Fallopius ¶ and Cowper mention only one to be found there, which probably was the one which Dr. Trew afterwards found. It is with the aſſent of Dr. Trew that he here declares, that theſe ſeſamoide bones, of which Trew writes, are not new and undeſcribed ones, as they had appeared to himſelf as well as to that writer; but that, as they were known long before, yet ſunk into oblivion at that time, as they had not of a great while been written of by any anatomiſt, nor ſhewn in any courſe of lectures: it cannot but be judged much to the honour of Dr. Trew, that he firſt at this time diſcovered one, and to our author that he afterwards ſhewed another in the femur, and they deſcribed and delineated them in their natural ſize, and with accuracy, that will leave no room for farther doubt about them. See T. 1. Fig. 2, 3, 4. It is a very great ſervice that the figures of parts, not before perfectly known, are of to anatomy.

NOTE 2.

Morgagni, when he ſpeaks of the generation and regeneration of the epidermis, ſays that he is of opinion, that the epidermis is nothing elſe but the upper ſuperficies of the cutis itſelf, which grows hard, and, as it were, in ſome degree callous, by the external compreſſion; and thence grows to be inſenſible, and, as it were, dead. But it is to be anſwered to this, that the epidermis is perfectly formed in the fœtus, while in the uterus, when there have not been theſe cauſes of induration: where the whole ſurface of the body has been ſurrounded by the liquor amnii, which is ſoft and mucilaginous, and by no means capable of making ſuch a compreſſion as is neceſſary, according to this author's ſyſtem, for the formation of this part; nor could give it that hardneſs, dryneſs, and calloſity which this author allows in it.

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§ Anatom. Corp. hum. l. 1. c. 28.

‖ Anthropolog. l. 5. c. 43.

* See his Anat. c. 14.

† De Re Anatomica, S. 65.

‡ Anthropolog. p. 729.

¶ Obſervat. Anatom. p. 441.

Beſide Ruyſch teaches us, in his Adverſaria, a way to prepare, in a beautiful manner, the cuticle and corpus reticulare of Malpighi; and in that place very ſeverely cenſures St. Andre, who had not only aſcribed veſſels to the cuticle, but aſſerted, that he was able to fill theſe veſſels with a red injection, in ſuch a manner, that they ſhould become turgid, and very beautifully viſible to the naked eye, in great numbers.

NOTE 3.

Many of the modern anatomiſts deſcribe glands, which they call glandulæ ſebaceæ; and tell us are ſituated here and there in the cutis, eſpecially in the ears, the eyelids, the noſe, the areolæ or circles round the nipples, the ſcrotum, the ſkin of the penis, the prepuce, the nymphæ and labia pudendorum, the anus, the axillæ, and ſeveral other parts: from theſe they tell us, that a ſebaceous matter, thick and fatty, may frequently be expreſſed; but Berger and Vercellonius contend, that theſe imaginary glands are in reality no other than the extremities of the arteries, dilated into a kind of veſicles.

Finally, Boerhaave informs us, that thoſe corpuſcles which are called ſebaceous glands, and which have a ſmall aperture which is their emiſſory, and which perforates the epidermis, are rather to be eſteemed receptacles of an oleaginous or fatty humour, than glands formed for the ſecreting of it. To which this author adds, that this humour, ſuppoſed by others to be ſo ſecreted in theſe parts, is more rationally to be ſuppoſed depoſited in them from the mouths of the minute arteries of the cutis; and that, while in the act of ſecretion, it was not thus thick, but fine, ſubtile, and thin; that, during its ſtay in thoſe receptacles, its thinner part has been exhaled; and the remainder, by that exhalation, reduced to the thick and ſebaceous conſiſtence in which we ſee it; and that this matter, thus become thick, may very eaſily be ſuppoſed to diſtend, fill up, and render its receptacles viſible, and give them much the appearance of glands. Theſe tubercles are frequent in the face, eſpecially about the noſe; and this ſeems a much more rational account of them than the ſuppoſing them glands.

It is theſe tubercles which have been miſtaken for living animals by many, and called worms of the ſkin: their extremities often appear in form of black ſpecks on the ſurface of the ſkin; and, on preſſing them forcibly, a white, thick, fatty or ſebaceous matter may be ſqueezed out of them. It is natural for a tough matter, thus forced out at a narrow orifice, to repreſent the figure of a worm, and hence has ariſen the error.

Boerhaave carries this doctrine much farther, and with great reaſon; and propriety deduces the origin of the other puſtules, called atheromata and melicerides, from the ſame cauſe; and our author always gave into the ſame opinion, and publickly taught this doctrine, of what had been by ſo many called ſebaceous glands: of this more will be ſaid in its place, in the Adenologia: from the whole, however, it muſt needs be allowed, that cutaneous glands, properly ſo called, are not ſo numerous as many have ſuppoſed them; nor that there is one of them under every pore of the ſkin, deſtined for inſenſible perſpiration, as Steno and many others, ſince his time, have imagined, and have indeed publickly taught.

Boerhaave himſelf, however, in his epiſtle to Ruyſch, ſeemed inclined to take theſe folliculi for glands; but Ruyſch, in his anſwer, convinced him perfectly of the error. Our author's farther opinion on this ſubject, ſee S. 399.

NOTE 4.

The ligament, called ligamentum Poupartii *, is ſaid to be a robuſt ligament, extended from the anterior ſpine of the os ilei to the upper part of the os pubis; and it is aſſerted, that, by means of it, the connivance of the muſcles of the abdomen, where the proceſs of the peritonæum and the ſpermatick veſſels in men paſs out, is greatly aſſiſted; and that the inteſtines are by this prevented from falling thro' ſo eaſily, and forming hernias. But Morgagni ‖ more judiciouſly denies the exiſtence of this ligament, as a diſtinct and ſeparate

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* See Memoirs of the Paris Academy 1705.

† See Adverſ. Anat. 3, p. 3.

thing; and aſſerts, that it is no more than the lower rim or verge of the tendon of the muſculus oblique deſcendens. Our author was always of the ſame opinion; and therefore, not to multiply parts unneceſſarily, had wholly left out the very mention of this nominal ligament in the firſt edition of this work.

Cowper is alſo evidently of this opinion. It is not to be denied, indeed, that this part of the tendon of this muſcle does perform the office of a ligament, and even does the ſervice that is attributed to it by theſe authors, in preventing the occaſions of ruptures; but this is no new diſcovery. Veſalius plainly ſhews, that he was acquainted with it in his account of the parts.

NOTE 5.

The celebrated Tournefort was very firm in the opinion, at one time, that the effect of vomiting was ſolely owing to the action of the muſcles of the abdomen, and he taught this publickly; but Schelhammer rejected the opinion a great while ſince. After this Chirac, and after him Du Verney, aſſerted that vomiting was the effect of the joint force of the diaphragm and of the muſcles of the abdomen. And, finally, after all theſe, Littre proved, by very cogent reaſons, that the ſtomach alſo concurred in the producing this motion; tho' the authors before mentioned had wholly excluded it from any part or ſhare in it *.

NOTE 6.

Many of the anatomical writers have averred, that they have obſerved certain ſpheroide little bodies, which they will have to be glands, in the peritonæum, the pleura, and the pericardium. But we are to remark, that all the obſervations of this kind have been made upon morbid bodies; and that no ſuch ſpheroidal ſubſtances are to be ſeen in the diſſection of perſons who have been taken off in a ſtate of health: it is hence very obvious, that theſe bodies, ſuppoſed to be glands by the authors who obſerved them, are, in reality, tubercles of a morbid kind, and the mere effect of the diſeaſe of which the ſubject they were found in died; and, probably, have owed their origin to a ſtagnation of humors in the ſmall arteries of theſe parts. This

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* See Memoirs of the Paris Academy 1700.

kind of error of miſtaking morbid tubercles for natural glands, has gone very far among our anatomiſts; and has given occaſion to the deſcriptions of a great many glands, which are not to be found in ſound bodies, and which thence alone are ſufficiently proved not to be glands at all.

Cheſelden * tells us, that he found in a woman, who had died dropſical, the peritonæum three inches thick, and glands in it viſible to the naked eye. But it is very rational to ſuppoſe, from the ſtate of this morbid and monſtrous peritonæum, that theſe bodies, ſuppoſed by this author to be glands, were not truly ſuch; but were, in reality, morbid tumors of the part. As, from the ſame cauſe, we ſometimes meet with calculous concretions, nay, boney and cartilaginous ones; atheromata and ſteatomata, and other unuſual and unnatural productions, in different diſeaſed parts of the body.

Nay, we meet with accounts of the parts themſelves frequently concreted into a boney, ſometimes alſo into a kind of ſtoney ſubſtance, from the ſame cauſe †; yet we imagine no body would refer to ſuch accidental and unnatural changes, for the explication of a ſyſtem of the natural parts.

In the ſame manner the judicious anatomiſt will avoid referring to things which appear in morbid ſubjects for the explanation of the parts; nor is it eaſy to conceive that it ever can be proved, that bodies of this kind, found only in a preternatural ſtate of the parts, do really exiſt at all in them in a natural one, much leſs that they are glands.

Many of the moſt pompous diſcoveries of the later anatomiſts are to be referred, we are afraid, to the ſame cauſe. The author has ſpoken with an honeſt freedom in the Adenologia; but thoſe who have written ſince have not paid ſo much reſpect, as it would have been to their credit to have done, to what he has ſaid.

NOTE 7.

Winſlow, a very juſtly celebrated anatomiſt of Paris, firſt obſerved and deſcribed a peculiar natural aperture or foramen into the cavity of the omen-

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* See Cheſelden's Anatomy, Ed. 1. p. 96.

† See Memoirs of the Paris Academy 1700.

tum, by means of which that part might be conveniently diſtended by inflation, for the obſervation of its ſtructure and parts.

This aperture is to be ſought under the great lobe of the liver, near a certain membranaceous ligament, which joins the beginning of the duodenum and the neck of the gall-bladder to the liver, on the ſide of the eminence, which is the root of the little lobe of Spigelius, and between that and another ligament, which connects the colon to the pancreas.

Theſe two ligaments, where they unite, leave between them a certain interſtice or aperture, as this author ſays, of four or five lines in diameter, in a child of four years old, thro' which aperture the eminence juſt mentioned paſs. If a large tube is let in at this aperture, and the reſt of it cloſed by the fingers, all the cavity of the omentum may be inflated by a moderate blaſt; and in this ſtate the part repreſents a kind of ſack or bag, but of an unequal and irregular figure. The ſame author obſerves, however, that this cavity, into which the air is by this means introduced, is not formed ſolely by the omentum; but by the upper ſuperficies of the meſo-colon, with part of the ſuperficies of the colon itſelf, and of the ſtomach: and, finally, that membrane, which the ſpace between the two orifices of the ſtomach, and which he calls the leſſer omentum, all concur to the making up the bag thus formed by inflation at this aperture.

The uſe of this aperture he ſuppoſes to be, that, if any humors chance to be collected in the cavity of the omentum, they may have a way out by means of it, eſpecially when the perſon lies on his back.

NOTE 8.

Malpighi himſelf, in his poſthumous works, acknowledges that he doubts whether theſe ductus adipoſi are truly diſtinct veſſels. And Morgagni, in his Adverſaria, has very juſtly hinted, that they are not neceſſary as ſuch; ſince it appears, that the ſecretion of the fat may as well be performed in this part as in any other, immediately from the arteries into the adipoſe cells; and that it may alſo be again occaſionally abſorbed by the veins, without the neceſſity of imagining a third ſort of Veſſels, which Malpighi found it neceſſary, according to his ſyſtem, to ſuppoſe there ſhould be. Rivinus alſo, in his diſſertation on the omentum, abſolutely denies the exiſtence of ſuch ducts.

NOTE 9.

As to the fleſhy fibres of the ſtomach, Morgagni, ſpeaking of them, very juſtly obſerves, that Fallopius delivered a great deal as to the ſtructure of the ſtomach, and particularly as to what related to its orders of fleſhy fibres, which Willis afterwards claimed as his own. Helvetius deſcribes a very different ſituation of its muſcular fibres, with their courſes and diviſions, and that in a very elegant manner: his figures are alſo greatly ſuperior to thoſe of any other; but whether what he has laid down as their courſe be certainly, uniformly, and regularly ſo, is matter of doubt. Our author obſerves, that in diſſections he had frequently found them otherwiſe; and that in prepared and inflated ſtomachs, which he preſerved by him, this was evidently not the direction of them.

It ſhould ſeem moſt probable, from this, that the fibres of the ſtomach run variouſly in different people. Santorini alledges, that the fleſhy fibres of the ſtomach are not annular, but ſpiral; and that they are moſt conveniently ſeen, in robuſt bodies, about the pylorus. Our author, tho' he ſearched carefully for them in ſuch ſubjects, acknowledges that he did not find what Santorini had ſaid, perfectly anſwered. It ſhould ſeem pretty evident, upon the whole, that anatomiſts are often to be underſtood as ſpeaking only of ſome one or two particular ſubjects of their diſſections, when they ſeem to be ſpeaking of the human ſtructure in general. This is not the only inſtance in which two authors differ greatly in their deſcriptions of the ſame part, tho' both of them have written from their own abſolute obſervations. In the minuciæ of the human frame there are variations, in the particular ſubjects; nor are we to ſuppoſe them as invariable as the more eſſential particulars.

NOTE 9.

Malpighi will not allow, that there is any ſuch diſtinct coat of the ſtomach as that deſcribed by authors under the name of the villoſe one: his reaſon for this is, that it cannot be ſeparated from the nervous one; and, in conſequence, he allows of only three coats of the ſtomach, inſtead of four. He does not deny, however, that there are villi and papillæ in the ſtomach; but tho' he allows theſe, there are others who either abſolutely deny or at leaſt greatly doubt their exiſtence: but this is a doubt founded only on want of due obſervation. Ruyſch and Santorini have inſtructed us how to make them appear in the human ſtomach, by macerating it in warm water; and they are ſtill infinitely more obvious in the ſtomachs of ſheep, oxen, and many other quadrupeds. Morgagni adds, that he has obſerved in ſome human ſtomachs evident excretory paſſages, or oſcula opening into the ſtomach, which plainly alſo belonged to its glands: theſe, he tells us, he principally ſaw near the antrum pylori. Santorini alſo obſerves, that he had found in the ſame part of the ſtomach certain oſcula, or apertures, which he has given under the name of ſiphuncles.

NOTE 10.

The glandulæ Brunneri are very large and conſpicuous in the duodenum, in infants that have died with a diarrhæa or dyſentery upon them: but when theſe are to be ſought in other ſubjects, this inteſtine is to be boiled ſo long in water as till it ſinks to the bottom. After this the internal coat is to be ſeparated from the inner ſurface of the gut with proper care, and they are then to be ſought for: they will generally be ſeen very plainly in this manner, and eſpecially in that part of the inteſtine which is neareſt the ſtomach.

NOTE 11.

Albinus, in an inaugural diſſertation publiſhed in the year 1722 at Leyden, in which he exhibits a new deſcription of the ſmall guts, teaches a way, in which, by turning one of the ſmall inteſtines inſide out, and afterwards immediately inflating it, and then drying it, the nervous coat may be converted into an elegant and new cellulous one, different from that of Ruyſch; and his experiment will always ſucceed, if ſet about with the neceſſary cautions. The ſame author has given, in his diſſertation, many other obſervations

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and remarks, on other parts of the inteſtines, worthy obſervation: he alledges, that the tunica celluloſa of Ruyſch is ſituated between the external membranaceous common and muſcular coat; and that it does not ſurround the whole inteſtinal canal, but is wanting in that part which is againſt the mediaſtinum, and is in reality propagated from the mediaſtinum: but his new cellulous coat is ſituated between the villoſe and muſculous ones, and forms what is called the nervous coat, ſurrounding the whole cavity of the inteſtines *.

Finally, that the fleſhy longitudinal fibres are only placed in the part which is oppoſite to the meſentery, and are not like ſo many threads extended along the whole inteſtines; but are interrupted, as it were, in the manner of the muſculi recti of the abdomen.

He obſerves alſo, that the annular fibres are not inſerted into the meſentery, as Willis declares; but that their contractions are toward the meſentery; that, by inflation, all the rugæ or wrinkles of the nervous coat, or of his new cellulous coat, and the valvulæ of theſe inteſtines, diſappear immediately; and that, by this method, the villous coat is eaſily ſeparated from the nervous, which otherwiſe is not ſo eaſy.

He adds, that the villi on the tunica villoſa, by means of a ſlight maceration in warm water, and frequent changing and waſhing with it, may be rendered diſtinctly and elegantly viſible, when a piece of the gut, inverted and cleared from its lubricous mucus, is ſuſpended in a clear fluid; and that theſe villi will be rendered yet thicker, and more obvious, eſpecially ſuch of them as communicate with the veins, if they are firſt diſtended by a wax injection. Finally, he adds, that the veins of the inteſtines may be conveniently and elegantly filled with ſuch an injection, by means of the arteries, and the arteries thro' the veins; and that the

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* Helvetius, in the Memoirs of the Paris Academy 1721, tells us, that he had found two new cellulous coats in the inteſtines: the one of theſe he places between the muſcular and nervous coat; the other between the nervous and villoſe, which undoubtedly is the ſame as Albinus's. But he obſerves, that he had not ſufficiently examined theſe.

† Helvetius maintains the contrary, and ſays the longitudinal fibres are ſtrongeſt near the meſentery, p. 397.

matter of the injection may, from either, be forced into the cavity of the inteſtine; and that, in this caſe, when the gut is carefully laid open and examined, the injected matter will be found adhering to the villi of the inner coat, in the form of little worms.

NOTE 12.

The inner coat of the inteſtines is commonly called the villoſe one, by anatomiſts, from there being a multitude of fine and thin villi, reſembling the nap of velvet, upon it *. This villoſe matter is moſt obviouſly ſeen in the inteſtines of a dog, a hog, or ſome other quadruped, after macerating a part of them for two or three days in warm water, often changing the water, and finally ſtirring the inteſtine well about in it.

Ruyſch has obſerved, that there are not only theſe villi, but a number of papillæ alſo, obſervable in this coat of the inteſtines, which he therefore calls the villo-papilloſe one §: but, on the other hand, Helvetius abſolutely denies the exiſtence of thoſe villi, which are ſaid to be like ſo many hairs, in this coat: he aſſerts, that it conſiſts ſolely and entirely of mere papillæ, which are ſpongy, fat, of an irregular figure, and have their extremities pierced with innumerable little holes. He has figured theſe as they appear before the microſcope; and for this reaſon he calls this coat by a new name, membrana papillaris; and he aſſerts, that the foramina of theſe papillæ abſorb the chyle, and carry it to the lacteals: this is diſtinguiſhing very nicely, however, and perhaps not with ſo abſolute a certainty as the author ſuppoſes. Theſe papillæ are only diſcoverable by the aſſiſtance of very powerful microſcopes: they appear like villi to the naked eye; and indeed, by the ſame microſcopes, villi are perceived in different places among them: ſo that, upon the whole, it ſeems more adviſeable to keep the old name, tunica villoſa, than to change it.

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* See Bartholin. Anat. 9. renovat. p. 297. fig. 1. Magnet. Theatr. T. 69; and Pechlin. de Purg. T. 2. fig. 3.

§ See Adverſ. Anat. 1. p. 25.

‡ See Memoirs of the Paris Academy 1721, p. 35, Memoir 392.

The uſes of this coat of the inteſtines are elegantly explained by Albinus and Helvetius; and what has been before obſerved, added to the matter of this note, tends not a little to elucidate their doctrine on this ſubject.

Helvetius, in the ſame place, ſpeaking of theſe fibres of the inteſtines, which authors in general declare to be ſpiral or annular, does not allow that they are either; but figures and deſcribes them as perfectly irregular, and as a kind of rude ſegments of circles, collected into faſciculi.

NOTE 13.

Beſide the authors commemorated in this place, as the obſervers of the lacteals, Rolfinch, in his Diſſert. Anat. l. 5. c. 22. p. 906. produces ſome other authors, who, he ſays, he is of opinion had ſeen theſe veſſels; and even goes ſo far as to put Hippocrates and the Arabians into his Liſt. Among the more modern ones he mentions Veſalius, Fallopius, and Varolius, whoſe words he ſeverally brings to prove it. See alſo, on this ſubject, the Inventa Nov-antiqua of Almeloven, S. 23.

NOTE 14.

In the year 1717, a youth of a robuſt conſtitution, who had been feaſting and drinking plentifully at a neighbouring fair, was ſuffocated in a ditch, into which he fell by accident, on his attempting to return home. The day afterwards the body was committed to this author for diſſection, by the curators of the Altorff academy: he was at that time engaged in the courſe of his reading, in the demonſtration of the common teguments and muſcles of the abdomen. On the day following, when he came to examine the inteſtines before his numerous auditory, tho' this was the third day after the death of the perſon, there appeared ſuch a vaſt number of the lacteals under the membrane of the meſentery, and upon its fat, that the inteſtines and meſentery ſeemed covered, as it were, with them; and they were, at this time, full of a white milky fluid. The quantity and plainneſs of theſe veſſels, in this accidental ſubject, were vaſtly greater than they ever are in dogs, or other quadrupeds, fed and prepared on purpoſe for this examination. In theſe laſt ſubjects they uſually only follow the courſe of the veſſels of the meſentery; but in this man they extended themſelves promiſcuouſly over the whole meſentery, and had a multitude of inoſculations: ſome of them alſo evidently entered the glands about the inteſtines, and others were in part buried in the fat of the meſentery, ſo that their progreſs could not be diſtinguiſhed; and, finally, a part of them went away to the more remote glands, as thoſe figured at the end of this work, Tab. 2. Fig. 8. which were in the ſubject itſelf ſo elegant and fine, that neither the drawer nor the engraver have been able to come up to nature.

After this, in the year 1718, the author, before a numerous audience alſo, on the 18th of April, demonſtrating on the body of a young perſon, who had died in a conſumption, obſerved the lacteals very numerous, and diſpoſed in the ſame manner as in the former ſubject, and this twenty-four hours after the perſon's death. In this ſubject alſo, and in another ſoon after, the author and his pupils evidently diſtinguiſhed them coming out of the duodenum itſelf.

In the year 1719, he alſo obſerved a very large lacteal in the duodenum, near the pylorus; and from that time he occaſionally obſerved, and ſhewed to his auditors, lacteals in different number and condition in ſeveral of the bodies he demonſtrated on, tho' it has ſeldom happened to him to find them ſo obvious and ſo turgid as in the caſes juſt mentioned. As they are, however, very rarely ſeen in human ſubjects at all, and ſcarce ever in ſuch abundance and fullneſs; and as the figures given of them by the anatomiſts in general, are from quadrupeds, it appeared very proper, when ſuch an opportunity offered, to have them delineated from a human ſubject, and to expreſs the difference between their courſe and figure in the human frame and in quadrupeds. Nuck, in his Adenographia, Fig. 9. has given a delineation of the lacteals, as he ſays, from a human ſubject; but he gives ſo few of them in the quantity of the inteſtine he exhibits, that they appear much more probably to have been the veſſels of a dog; for in both the human ſubjects, in which they appeared ſo beautifully to our author, they were, at leaſt, ten times as numerous as in this figure of Nuck's. The valves, which he has delineated ſo large and fair in them, do not appear in thoſe of human ſubjects as they occur to us in diſſections: their figure is truly ſuch as repreſented in our figures; but when their diſſection is made in a quadruped, prepared for it, and juſt killed, and the veſſels are tied, there the valves and tubercles appear, and not otherwiſe.

In the firſt ſubject diſſected by our author, in which they appeared ſo fair and numerous, the perſon was young: he had been eating heartily, and he was inſtantaneouſly ſuffocated, and conſequently the motion of the chyle in the veſſels was ſtopped juſt at a time when they were filled to the utmoſt: hence it was, that theſe veſſels were ſo elegantly ſeen in this ſubject. But in the other body, the perſon having been conſumptive, jellies, broaths, emulſions, and other ſtrengthening things, had been given him, almoſt to the time of his laſt breath; and to this it was owing, that they were ſo well filled, and ſo beautifully conſpicuous in him.

Theſe were opportunities in which it was natural to expect to find the lacteals filled and viſible; but as they are occaſions which occur but very ſeldom, it is not a wonder that anatomiſts ſo rarely meet with a view of the lacteals, in human bodies, in any great degree of perfection.

Morgagni, however, has been ſo fortunate as to meet with much ſuch another view of them, as he informs us in his Adverſ. Anat. 2. p. 92. and in his Adverſ. 3. p. 31. he deſcribes them alſo as he ſaw them in the duodenum, a little below the pylorus. Muſgrave gives a very elegant method of filling the lacteals in a dog, with a fluid tinged with ſtone-blue, in the Philoſophical Tranſactions, Nº. 275.

NOTE 15.

There have been, among the anatomical writers, many who have denied the exiſtence of the receptaculum chyli in human ſubjects: ſome have aſſerted, that the lumbar glands performed the office of ſuch a receptacle; but experience is againſt this. Not only our author has ſometimes filled this receptacle, along with the thoracic duct, with quickſilver, and that in a very elegant manner, in human ſubjects; in which caſe it appears a fine thin membranaceous ſack, ſometimes ſingle, ſometimes double; but many other anatomical writers, whoſe own credit is ſufficient to ſupport the aſſertion, and whoſe atteſtations are confirmed by this experiment, have elegantly and juſtly figured this with the thoracic duct in the human frame. Cowper in his Anatomy, Bidloo in his Diſſertation de Organ. Chylif. Drake in his Anthropologia, Salzman and Wius in particular diſſertations, and Henninger in the German Ephemerides, Cent. 3. as well as Cant, T. 6. have all juſtly delineated and deſcribed it.

NOTE 16.

The uſe of the ſemilunar valve in the ſubclavian vein, at the inſertion of the thoracic duct, is to this time generally underſtood to be for the cloſing that duct, that the blood from the ſubclavian may not ruſh into it. But Jo. Adolph. Wedelius diſſents from this: he will by no means allow, that it was formed with this intent; and demonſtrates, that no blood from the ſubclavian could ever enter the thoracic duct, if no ſuch valve as this exiſted. The valves in the thoracic duct alone, and eſpecially with the aſſiſtance of the fluid contained in that duct, would always be able to reſiſt the impulſe of the blood attempting to force its way into it, as he abundantly proves. He adds alſo, that the poſition of this valve is ſuch, that it is by no means calculated for the preventing the ingreſs of the blood into this duct, if the nature and conſtitution of that duct permitted it. He goes on to ſhew, that this valve, together with a ſimilar one on the oppoſite ſide, does the ſame office in this as the other valves do in the other veins; that is to ſay, they ſerve to prevent the blood going this way back again from the vena cava in the contraction of the heart.

NOTE 17.

We have very few of the lymphaticks truly delineated from human ſubjects; and even Nuck's in his Adenographia, which have been generally allowed to be taken from human ſubjects, on a ſtricter enquiry, as obſerved in another place, prove to be either from quadrupeds, or, what is worſe ſtill, from imagination. His figures of the heart, the kidneys, and ſome other parts, give ſufficient ground for this concluſion, as the experienced diſſector will eaſily diſcover. Thoſe which he adds to the human uterus were certainly never ſeen by him, but contrived by his own fancy, in conſequence of that analogy he obſerves between the lymphaticks of brutes and thoſe of the human ſpecies. For ſince theſe veſſels can ſcarce poſſibly be ſeen, except in living ſubjects, and ſince women are not to be diſſected alive, for the looking after them, it appears ſufficiently that there is no room to ſuppoſe them real. But tho' we can by no means allow theſe to be juſt figures of the lacteals of the human uterus, we are far from declaring that there are none there. On ſome very fortunate diſſections they have been found; but they are uſually few in number, and what there are, are very ſmall.

NOTE 18.

Our author has, in two papers publiſhed in the German Ephemerides, Cent. 5 and 6. deſcribed two human gall-bladders, in the cyſtick duct of each of which he diſcovered certain beautiful and ſurpriſing valves of a ſpiral figure; and, as they have not been mentioned by any other author, they are figured again in this work, Tab. 3. Fig. 9. where there is alſo added a third and new delineation of the cyſtick duct of a woman, diſſected by the author, after the publication of the others; in which alſo he obſerved a number of membranes, ſome in a tranſverſe, ſome in an oblique ſituation, which divided the duct, as it were, into a number of cells. Theſe, however, did not entirely cloſe the duct in any part, but were diſpoſed much as the valvulæ conniventes in the jejunum and colon.

Gliſſon ſays, indeed *, that certain anatomiſts had framed, from their own imagination, valves in the ductus cyſticus; but that he is of opinion, that what led them into the error was the fibrous annulus of the cyſtis; for that he never was able to find a real valve there.

Bianchus § alſo, in the ſame manner, roundly aſſerts, that the valves, ſpoken of in the neck and the cyſtis

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* See Tract. de Hepate, c. 14.

§ See Hiſt. Hep. Ed. prim.

fellea,

ſellea, are imaginary: but the author of theſe obſervations, who has found the parts already mentioned not only once, or in one ſubject, but many times, and in many, is not afraid to appeal to the publick, whether they are or are not valves. Their uſe alſo, is a ſubject very worthy to be inquired into. We are not to omit to take notice, however, that Bianchus, in a ſucceeding edition of his work, has recalled his words, and even acknowledged, that demonſtration had taught him to own that they were not imaginary, but real.

Bauhine*, Bidloo †, and Veſtus ‡, however, have mentioned in their time certain valves in this part: and Schelhammer § has gone ſo far toward it as to allow, that the cyſtick duct will not admit a ſtyle either from the part next the duodenum, or from that next the cyſtis; but that it very readily admits of inflation either way. It is probable, that this author, in the ſubject which he is deſcribing, really met with a cyſtick duct with ſome of theſe valves in it; tho' he refers to another cauſe, what was evidently an effect of their being there. Finally, it is to be remembered that Plancus found, as himſelf ſays, valves in this place; and thoſe, as it appears, ſuch as thoſe deſcribed from one of our author's ſubjects: his deſcription of them is, that they perfectly reſembled the turn of a ſnail-ſhell ‖.

NOTE 18.

It has been to this time much diſputed, whether there are or are not ducts, which immediately, or without the intervention of any other duct, do convey the bile from the liver into the gall-bladder.

Bohnius gives ſome very remarkable experiments ¶, by which it appears that there are evidently ſuch ducts in men: and adds, that Gliſſon and Blaſius had mentioned them before him: from this he concludes, that ſuch ducts are neceſſary alſo in the human frame, and conſequently that there are ſuch there. But, on the other hand, the anatomical writers of moſt reputation, tho' they allow that in many quadrupeds there are ſuch ducts, yet abſolutely deny that there are any ſuch in the human frame; and our author joins his teſtimony to theirs, that there have not been any ſuch found.

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* See Theat. Anat. p. 156.

† See Anat. T. 38. fig. 3.

‡ See Obſ. in Cramer. Colleg. Chym.

§ See Analect. Anat. Diſſert. 11. N. 23.

‖ See Epiſt. ad Joſ. Pozzum, p. 20.

¶ See Acta Eruditor. Lcipſ. 1722.

Cheſelden, in the firſt edition of his Anatomy, mentions a caſe, in which he ſays, he found theſe ducts in a human ſubject; but he adds, that they were extremely minute: the ſubject was a perſon who had died in a jaundice. He gives a figure of the gall-bladder in his 18th Plate. But, in his third edition of the ſame work, he recalls his aſſertion, and allows that he had advanced it like a young anatomiſt; and acknowledges, that he never afterwards could find theſe ducts, tho' he had ſearched after them with the utmoſt attention and care.

After all this, Bianchus, in his hiſtory of the liver, takes infinite pains to eſtabliſh the doctrine of theſe ducts again: he alledges many reaſons why they ſhould be found, and brings many experiments and obſervations to prove the truth of what he aſſerts. He even diſtinguiſhes the ducts he found into two kinds, the hepatico-cyſtick, and the cyſtico-hepatick; and has given very pompous figures of them: how the ſucceeding anatomiſts will find them, time will ſhew us. Added to the weight of his own obſervations, he brings the teſtimony of Cajetanus Taconis, a phyſician and philoſopher of Bononia, who, in a letter to him, accompanied with ſome figures, takes a great deal of pains to prove the exiſtence of ſuch ducts, running from the liver to the gall-bladder; and gives the conformation of the parts, and courſe of theſe ducts, as he ſays he obſerved them in a morbid ſubject. Soon after the publication of this, however, there appeared a letter of J. Pozzus, profeſſor of anatomy at Bononia, to Plancus: this was publiſhed in 1726; and in this letter, and Plancus's anſwer, the matter is ſet in a new light. All Taconis's obſervations are ſaid to be erroneous and falſe; and it is aſſerted, that he was deceived by taking the arteriolæ of the cyſtis for ſuch ducts as all this pains had been taken to eſtabliſh.

Our author, who never omitted the utmoſt pains in his diſſections, to enquire into the truth of a ſubject ſo much in diſpute, tells us, that, after all theſe altercations about it, he at length thought he had found it to be a truth, that there were ſuch ducts. He diſcovered, before a numerous aſſembly, what appeared to be a duct of this kind, or a true hepatico-cyſtick duct. Its ſize was ſuch as might countenance the opinion; its colour yellow, and its ſituation was near the hinder part of the neck of the cyſtis, or gall-bladder: but others ſhould be informed, from his conduct, how to treat what appear to them in the light of new diſcoveries. He examined this veſſel along its progreſs; and, finally, making a ſmall aperture in it, and inflating it, he found it was diſtributed over the cyſtis in the manner of the ramifications of a ſhrub, or little tree; and, in fine, that its trunk was a blood-veſſel of the cyſtis, and theſe its ramifications; tho' its colour and ſituation, which was much the ſame with that of ſome of the hepatico-cyſtick ducts in oxen, would have led many people to have aſſerted, with great boldneſs, that it was truly ſuch a duct as we know there is in that animal, and as had been ſo long ſought in man in vain.

Upon the whole it appears, that it is eaſy to be deceived unto an opinion of theſe ducts being found where they are not; and that, from the ill ſucceſs of the generality of anatomiſts in their ſearches after them, it appears, that if there are ſuch in human ſubjects, as ſome anatomiſts who ſeem to be worthy credit, affirm, that they are not univerſal, but are very rare.

NOTE 19.

Thoſe authors, who have ſaid that the ſubſtance of the liver is glandulous, have been led to it principally from the obſervation, that in morbid ſubjects, particularly in ſuch as have died in dropſies and atrophies, there have been a multitude of ſpheroidal bodies found in it: but, as it appears by repeated and continual obſervation that no ſuch things are found in the livers of perſons who die without theſe diſeaſes, it is to be inferred that they are, when found, not glands, but morbid tumors and tubercles.

If the liver of a horſe or ox are examined, tho' they are very large, and all the parts are very viſible and diſtinct in them; yet the niceſt enquiry will not be able to diſcover in them any peculiar and diſtinct bodies wrapped up in their membranes: and, on the contrary, if the tubercles that are found in the livers of morbid perſons be ſtrictly examined, they will not be difficultly found to be morbid, and quite out of the courſe of nature. Our author mentions an inſtance of what would have deceived many people, of ſanguine imaginations, into an opinion of their having found theſe glands, tho' without any real foundation. This was in a body he opened, in company with Boyer: in this the ſurface of the liver ſhewed a prodigious number of round white bodies of various ſizes, which appeared perfectly like what many have deſcribed as glands: the ſubject was a woman, who had died dropſical; and when theſe tubercles were opened, and their contents examined, it was found that they were filled with a matter as different as well could be from that of the liver, and much like that contained ſometimes in the harder encyſted tumors, like ſuet or fat.

The liver, in this ſubject, was grown to twice its natural dimenſions; and, on opening it, a multitude of the ſame tubercles were found in its ſubſtance: ſome of theſe were as big as an egg, others ſmaller; many of the ſize of a nutmeg. The colour and whole appearance of all theſe was like that of thoſe on the ſurface, very different from that of the liver; and it eaſily appeared that theſe tubercles, tho' they were of a roundiſh figure, were not glands, but morbid tumors, which acidentally reſembled the figure of glands.

After this he proceeded to examine carefully the like bodies, which he found emulating the appearance of glands in the livers of diſtempered human ſubjects, as well as quadrupeds, and he always found them of the nature of encyſted tumors; which kind of tumors will riſe in the internal as well as on the external parts, and in both have ſo much of the appearance of glands, that it is eaſy for the unwary to be deceived by them.

There have not been wanting others, who, having found morbid veſicles in the liver, have ſuppoſed them to be glands; but we ſhall have occaſion to ſpeak at large on a ſubject of this kind hereafter, ſee Note 75, and need therefore only obſerve here, that this opinion is equally erroneous with the other.

NOTE 19.

Palſinus, in his Anatomy, p. 184, blames our author for having aſſerted the ingreſs and egreſs of the bile, contrary to the opinion of Verheyen: its ingreſs, thro' the cyſtick duct into the cyſtis; and its egreſs, thro' the ſame duct into the ductus cholidocus. He calls in, to the ſupport of his cenſure, the names of a great many very eminent anatomiſts who utterly reject this ſuppoſition, and agree with Verheyen; who declares it as his opinion, that it is impoſſible that the bile ſhould, by the ſame duct, run into the cyſtis, and run out of it again. But Bohn * and Ortlobius † have advanced this opinion, and that on the teſtimony of infallible experiments, which experiments our author has repeated, and found to be juſt, and the concluſion certain. Cole ‡ alſo, and Maur. Hoffman §, and a multitude of others, join in our author's opinion; and Bianchus ‖ has abundantly confirmed the truth and certainty of it. It is to be added alſo, that whatever may be ſaid by ſome, as to the improbability of it, we have all the reaſon in the world to believe it may be; ſince we ſee the very ſame thing evidently happen in the veſiculæ ſeminales.

NOTE 20.

As many have found round bodies in the liver, which they have ſuppoſed to be glands; ſo ſome alſo have met with ſuch in the ſpleen, and have in the ſame manner ſuppoſed thoſe to be glands alſo: but as, in regard to thoſe imaginary glands of the liver, it appears that they have always been found in morbid bodies; ſo alſo, theſe of the ſpleen have been found in ſuch only. Whatever has been ſaid againſt the opinion of theſe tubercles in the liver being real glands, is of equal force here:

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* See Act. Erudit. Leipſ. 1682 and 1683.

† See Hiſt. Part. p. 135.

‡ See De Secret. Animal. p. 133.

§ See Idea Machin. Corp. hum. p. 55.

‖ See Hiſt. Hepat. c. 13.

nay, theſe round bodies in this part have ſtill leſs title to be ſuppoſed glands, than they might appear to have in the liver, ſince there is no ſecretion performed in the liver, nor has it any excretory duct; ſo that there cannot appear ſo much as a reaſon why nature ſhould have placed glands there. There can, indeed, be no uſe of glands where there is no ſecretion; and nothing is a more certain truth, than that nature never made any thing in vain. To this it may be added, that Ruyſch, in ſeveral of his works, has proved, to demonſtration, that theſe viſcera are of a vaſcular ſtructure, and that there are no true glands in them: and Schelhammer * has proved, that what Malpighi has figured and deſcribed as the glands of the ſpleen, hanging together like cluſters of grapes, is a mere fiction. See the Adenologia, S. 365.

NOTE 21.

There is no one of the viſcera the uſe of which is ſo obſcure as that of the ſpleen, and, conſequently, there is none which has given riſe to ſo many different opinions of authors on the occaſion. Many, who have found that it may be taken out from a living animal, without its receiving any hurt by the loſs of it, have joined with Eraſiſtratus † in ſuppoſing it a perfectly uſeleſs and ſuperfluous part of the frame, and have even accuſed nature of an error in putting it there. Others ſuppoſe that it is placed, as we ſee it, to keep up the equilibrium of the body, and with no other intent or purpoſe. Some have joined in the old opinion of Hippocrates and Ariſtotle, that it ſerved to draw off the watery matter from the ſtomach ‡: but the greater part of the antients have been of the opinion of Galen, that it was deſtined as the receptacle of the humour they called atra bilis, or melancholy. Some have ſuppoſed that a kind of ferment or menſtruum, neceſſary for the operations of the ſtomach in digeſtion, was ſecreted in the ſpleen, and thence conveyed into the ſtomach.

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* See Analect. Anat. Diſſert. 10. No. 22.

† See Galen. de Uſu Part. l. 4. c. 15.

‡ See Caſp. Hoffman de Uſu Lienis.

ſtomach. Some have ſuppoſed it the origin of laughter, according to the old Latin adage:

Splen ridere faciat, cogit amare hepar.

Others have advanced that its uſe is to inſpiſſate the blood: Havers * was of opinion, that its office was the preparation of that mucus which is ſecreted in the mucous glands of the articulations. Schelhammer †, and with him Liſter ‡, and ſome of the late Engliſh anatomiſts beſide, as Purcell §, &c. ſuppoſe it to be a kind of diverticulum for the blood in the more violent commotions: and to this Purcell adds, that it inſpiſſates the blood; and, by means of an acid of ſome kind or other, produces a precipitation, which ſerves for the better ſecretion of the bile. Others have found out other imaginary uſes for it; an enumeration of which would take up more room than the reader would think it worth. The opinion of our author is, that its office is to ſupply a particularly thin and fluid blood to the liver; by means of which the other thicker blood conveyed to it from the other parts, and from which a ſecretion of ſo much importance as that of the bile, is to be formed in this denſe viſcus, is rendered more fluid; and by this means the ſecretion of the bile is greatly promoted, and at the ſame time the obſtructions in the liver, which would otherwiſe probably be very frequent, and muſt be of bad conſequence, are prevented.

In confirmation of this opinion, if the ſplenic vein be opened in a dog, or other living animal, a thin and florid blood always runs out of it; not a thicker than that of the other veins, as the aſſerters of the opinions moſt received, as to the uſe of this viſcus, would infer.

NOTE 22.

As the liver and ſpleen have been declared by many to be glandular in their ſtructure, ſo the kidneys alſo have been judged to be ſo, and that from the ſame erroneous obſervations. Tubercles, which have the appearance of glands, are ſometimes found in the kidneys; and thence, as in regard to the two other viſcera, the whole ſubſtance of the kidneys has been judged to be glandulous. The bodies ſuppoſed to be glands in the kidneys, are not univerſal, or found in all; and where they are found, they are always mere morbid tumors. Sometimes veſicles alſo are found in the kidneys, and from theſe alſo they have been ſuppoſed to be of a glandular ſtructure: but what is truly the ſtate, in regard to theſe, will be explained hereafter in note 75.

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* See his Oſteologia.

† Analect. Diſſert. Anat. 10. S. 40.

‡ Tract. de Humoribus.

§ Tract. de Cholica.

NOTE 23.

Scarce any thing has been more obſcure and uncertain than the uſe of theſe glands. The academy of Bourdeaux very laudably propoſed their prize to the perſon who ſhould diſcover what was their true uſe; but, unfortunately, there appeared no body to claim the reward. Some time after this, however, Valſalva*, a very eminent anatomiſt of Bononia, wrote to many people, that he had found their real uſe, and had diſcovered certain ducts paſſing from them, in men, to the epididymides; and, in women, to the ovaria. He took care to have the notice of this diſcovery printed, and promiſed a diſtinct treatiſe on the ſubject; but, tho' the author lived ſome years after this promiſe, the treatiſe never appeared: and we are to add to this, that no man ſince has ever been able to find the ducts he ſpeaks of. There appears ſufficient reaſon, from this, to doubt the reality of theſe ducts; and adding to this, that theſe glands are very large in the fœtus, and gradually become ſmaller, as the child grows towards maturity, there appears very little reaſon to ſuppoſe them of uſe in generation. Malpighi has given an accurate and elegant account of their ſtructure.

NOTE 24.

Authors, in general, ſay there are only three tunics or coats to the urinary bladder; but as Wharton mentions a tunica cellulosa in the meſentery, and Ruyſch and others deſcribe a cellulous one alſo in the inteſtines, we are to allow the ſame reaſons of force, and even greater, are to be urged for the eſtabliſhing the doctrine of a cellulous coat in the bladder. It is evident, that between the outer and muſcular coat there is uſually, if not univerſally, a quantity of fat, and that often pretty conſiderable; and that this is ſecreted in peculiar adipoſe cells, and properly collected and preſerved in them, as in the other allowed membranes of this kind; ſo that, properly, we are to allow four membranes to the bladder.

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* See Valliſneri's Hiſtor. Generat. p. 353.

In dogs, and ſome other quadrupeds, indeed, this cellular membrane ſcarce comes in ſight at all; but in the human bladder it is often conſiderable enough to be very obvious. Its uſe ſeems to be to defend the bladder itſelf from the acrimony of the fluid contained in it.

NOTE 25.

Many things more there are to be pointed out, in regard to the teſticles: tho' they would ſwell the enumeration of their parts too much to be inſerted in the text, we may have permiſſion to mention them here.

Morgagni obſerves, that the firſt among the earlier writers, who diſcovered the ſubſtance of the teſticles to be truly vaſcular, were Arantius, Cabrolius, and the accurate and diſcerning Riolanus; but that De Graaf firſt demonſtrated the connections and uſes of theſe veſſels. The vaſcular ſubſtance is extreme clearly diſtinguiſhable in the teſticles of the tortoiſe *, the boar †, the ram ‡, and the dormouſe §.

We are to obſerve alſo, that the ſpermatick arteries do not always ariſe from the aorta; but the left ſometimes from the emulgent, and not unfrequently both from the hypogaſtricks ‖. This ſeems not to have been diſcovered by thoſe who tell us, that the ſpermatick arteries have been found wholly wanting in ſome ſubjects. De Graaf juſtly calls theſe triflers on ſuch ſubjects ¶. Lealis and Schrader ** alſo are of opinion, that the ſpermatick arteries, before they reach the teſticles,

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* See Ruyſch's Adverſ. Anat. 4.
† See Schelhammer's Analect. Diſſ. 12.
‡ See Lealis de Part. Generat.
§ See De Graaf and Cheſelden.
‖ See Nicolaus's Direct. Vaſor.
¶ See De Viror. Org. Generat.
** See Obſerv. Anat.

ticles, communicate by anaſtomoſes; but no body, beſide themſelves, have been able to make this out *.

The firſt deſcription of theſe arteries we ſeem to owe to Andromachus †. Morgagni obſerves, that the tunica albuginea of the teſticles may be eaſily ſeparated into two; and Teichmeir declares, that it truly conſiſts of three, namely, a tendinous one, a vaſcular one, and a nervous one ‡.

NOTE 26.

The diſpoſition of the teſticles and epididymides is not always regular or certain. Our author obſerved a very peculiar manner of it, in a ſubject publickly diſſected at Helmſtadt: in this ſubject the left teſticle was not in the ſcrotum, but in the abdomen; but that not in the pelvis at the ſide of the bladder, where other anatomiſts have uſually found it on this occaſion, but in that part where, in other ſubjects, the ſpermatick veſſels paſs out of the abdomen. It was alſo much ſmaller than the other, and had no epididymis. See its figure in Tab. 6. Fig. 25. m. The epididymis made its way thro' the muſcles of the abdomen, where the ſpermatick veſſels uſually paſs out toward the ſcrotum, and extended itſelf thro' the left groin, as far as to the upper part of the ſcrotum. From the end of the epididymis the vas deferens was again turned upwards, and entered the belly near the epididymis, paſſing thro' the groin, and then thro' the muſcles of the abdomen, whence it paſſed in the uſual way to the left veſiculæ ſeminales. This diſpoſition of the parts, and the ſingular diviſion of the veſſels, are carefully expreſſed in the figure.

NOTE 27.

Lealis has figured the veſiculæ ſeminales as terminating in the urethra, by one common duct; and Boerhaave takes this upon credit from him §: and ſome of the French anatomiſts have done the ſame, obſerving in their writings, that the veſiculæ have more frequently only one ſuch paſſage than two. But our author, on the

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* See Heucher's Diſſertat.

† See Inſtitut. Anatom. p. 37.

‡ See Anthropology, p. 171.

§ See Inſtitut. Med. Ed. alter. S. 148.

the contrary, aſſerts, that in all the bodies he diſſected, he always found them two. He kept by him ſeveral preparations alſo, ſome injected and dried, and others preſerved in ſpirits, of the parts in their utmoſt perfection; in all which the ducts into the urethra were two: and his auditors, to whom he always demonſtrated theſe ducts as two, found it ever ſo, and ſaw the two orifices which he pointed out to them.

The anatomiſts, in general, alſo are of this opinion; ſo that all that can be properly aſſerted from Lealis's account is, that tho' theſe ducts are naturally and generally two, yet it is poſſible ſuch a variation from the ordinary courſe of nature may happen, as that there may be but one; and that the particular ſubject, from which he made his obſervations, had it ſo. Thoſe who have adopted his opinion, ſhould however have examined a variety of ſubjects themſelves, which would have prevented their delivering it ſo freely in his words. It is very eaſy to ſuppoſe that people, not much uſed to diſſection, might be able to find but one; but an accuſtomed eye will almoſt always ſee more.

NOTE 28.

Our author, in the preface to the ſecond edition of this work, obſerves, that in the very laſt ſubject that had at that time fallen under his examination, he had found, on diſſecting the parts of generation, beſide the ligamentum ſuſpenſorium of the penis, two other lateral ligaments, very like the ſuſpenſorium in all reſpects: theſe aroſe, on each ſide, from the oſſa pubis, a little above the origin of the muſculi erectores penis; and were inſerted into the ſides of the corpora cavernoſa of the penis, above the place of the inſertion of the ſame muſcles. A multitude of ſubſequent diſſections, however, in which the author carefully ſearched after theſe ligaments, gave him no more than two farther opportunities of ſeeing them; and in both theſe they were much ſmaller and weaker, than in the ſubject in which they were firſt obſerved. From this, therefore, it appears, that they are not general or univerſal parts; but rather accidental ones, appearing but now and then, as is the caſe in many of the minutiæ of anatomy, eſtabliſhed too freely as general by authors.

NOTE 29.

Cheſelden, in the firſt edition of his Anatomy, p. 160. much doubts the exiſtence of the glandulæ Cowperi, affirming, very frankly, that, in all his diſſections, he had never been able to find them. He adds, that unleſs theſe glands were a mere invention of Cowper's, it appears probable, that what Cowper ſaw was only ſome little glandulæ, diſtended by the morbid ſtate of the ſubject; or that they were a mere *luſus naturæ*, in ſome one body which Cowper happened to examine; as ſuch *luſus*, he obſerves, are more common in regard to the glands than to any other part of the body.

Such is the cenſure on Cowper in his pupil's firſt edition; but in his third edition of the ſame work we find all this omitted. One might have expected from this to have been informed, that he had ſince found theſe glands, which he at that time ſo much doubted the exiſtence of in ſome other bodies; but this does not appear. He does not ſay he had ſeen any thing more of them then, than when he wrote ſo freely againſt them: he only ſays, in this edition, that Cowper deſcribes three ſuch glands, p. 294. It is reaſonable, therefore, to ſuppoſe, that tho' he does not chuſe ſo flatly to deny their exiſtence any longer, he had not, however, at that time ſeen them. Morgagni, however, affirms, that he had found them in a number of bodies; and that they were ſometimes of the ſize of a kidney-bean, or larger, ſometimes ſmaller: but he acknowledges alſo, that he very frequently could not find them in his diſſections, tho' he took the utmoſt pains in ſearching for them *.

NOTE 30.

The exiſtence of the membrane called hymen in women, has been greatly diſputed by the medical writers of almoſt all times, ſince the firſt mention of it. There were many who, very early in the diſcovery, denied that there was any ſuch part; and there are many who continue to do ſo at this time; and many others who, tho' they will not deny but that the authors of reputation, who declare they have found it, have really ſeen a membrane in this part, aſſert that it is not univerſal, but was a mere accidental thing in thoſe particular ſubjects. It ſhould appear, however, to every practiſed anatomiſt, that all theſe, as well the doubters of the exiſtence of the hymen, as the abſolute denyers of it, have only been preſent at the diſſections of females who had had commerce with men; for had they examined the parts in young girls, and ſuch as had not been lain with, they could not have miſſed finding it. Our author, whoſe fidelity is no more to be queſtioned than his accuracy, declares, that in the courſe of his diſſections he had opened many young female ſubjects; and that in all theſe, whether juſt born, a few weeks old, a few months, or even as far as to thoſe of ſix years, always, and uſually as far as to fourteen, he found it. He has given deſcriptions and figures of the part in the German Ephemerides, 7 and 8; and the world has received what he has delivered on the ſubject as it ought. In females of theſe ages he alledges, that he always has found a membranous body, ſerving to render the orifice of the vagina narrower; and that it was ſometimes annular, and ſometimes ſemi circular or ſemi-lunar: ſo that it is by no means to be ſuppoſed a *luſus naturæ*, or an accident from a morbid ſtate in the bodies it is found in.

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* See his Adverſ. Anat. 4. p. 25.

It is to be acknowledged, that it is rarely met with in women at the age of maturity; and there are ſeveral very obvious reaſons why it is not. Among the authors who have always poſitively aſſerted the exiſtence of this membrane, we are to reckon Wier *, Riolan, De Graaf, Swammerdam, Morgagni, and Santorini; and to theſe, and a long liſt that might be added, we are to join Veſalius, as more than a common evidence: this author had a long time denied its exiſtence; but after he had examined ſome younger ſubjects, and women who were truly virgins, he acknowledged it.

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* See his Obſ. Med. p. 95, and 99; and his book De Præſtig. Dæm. l. 3. c. 19.

NOTE 31.

The thickneſs of the womb, in women big with child, has been a ſubject of much diſpute. Many of the medical writers, in particular Mauriceau * and Dionis †, have aſſerted, that the ſubſtance of the uterus is thinner in women who are big, than in ſuch as are not ſo; declaring it impoſſible that the uterus ſhould be ſo amazingly diſtended as it is, toward the end of the time, without a diminution of its thickneſs. But, on the other hand, Daventer has beſtowed a whole chapter to prove the falſity of that opinion ‡: and our author, after a careful diſſection and ſtrict examination of ſeveral women, who had died in different ſtages of pregnancy, and after opening the uterus in women who had died in parturition, and others who had died ſoon after, does aſſert alſo, that in theſe ſeveral obſervations he never had found the uterus at all thinner than in its common ſtate, but very often conſiderably thicker. Our author was particularly ſtrong in this opinion, after the publickly opening three bodies at Helmſtadt, in the compaſs of one year, all in a ſituation to determine it; two of them having died in labour, and the third from a wound in the head, near the time §.

It was objected to him, however, by a perſon of erudition, that, in regard to theſe caſes, poſſibly there might have been an uncommon quantity of blood directed toward the uterus about the time of parturition, by which it might be at that time ſwelled to the thickneſs, which he found equal to its natural one, out of a ſtate of pregnancy; but that, at other times of the period, this might not be the caſe, but the uterus might be thinner than uſual, as others had aſſerted. This doubt was, however, ſoon after cleared up by the diſſection of a woman, who had died by a ſhot in the eighth month; ſo that the time of her labour was not near. She had been in perfect health before, and had died inſtantly of the wound: in this ſubject, therefore, there could have been nothing of this particular deriva-

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* Traité des Maladies des Femmes groſſes.

† See his Surgery, and his book De Arte Obſtetric.

‡ See his Operat. Chirurg. c. 8.

§ See Act. Nat. Curioſ. vol. 1. p. 406.

tion of blood to the uterus; yet in her the ſubſtance of the womb was as thick as in others in the different periods of pregnancy, or at the time of delivery.

Beſide the authors cited by Daventer, in countenance of this opinion, and thoſe mentioned by our author in the Acta Curioſorum, where he treats of this ſubject, Morgagni, Littre, Voglius, Santorini, Vaterus, and a number of others, join in it.

We are to add alſo on this occaſion, that Ruyſch has diſcovered and figured certain ſeries of ſpiral or orbicular fleſhy fibres in the fundus of the uterus of child-bearing women, to which he has given the name of a new orbicular muſcle of the uterus *. He declares the uſe of this muſcle to be for the expulſion of the placenta, after the child is born. He adds, on this occaſion, that the placenta ſhould never be torn away by force; but that, if it does not follow on a ſlight pull, it is to be left 'till it is protruded in a great meaſure by the force of this new muſcle. In this, however, our author is of opinion, that it is greatly aſſiſted by the general ſtructure and action of the whole uterus.

NOTE 32.

The medical writers are by no means agreed as to the origin and ſource of the menſtrual diſcharges, ſome aſſerting that they are from the womb, others that they are only from the vagina. Morgagni † recites a long catalogue of authors of each of the two opinions: he adds, from his own obſervations, that all the blood thus evacuated is often immediately from the fundus of the uterus, but that it never is from the vagina. Our author joins alſo in his opinion, and obſerves, that, in two ſubjects he had diſſected at a proper time for this obſervation, he ſaw that the blood came only from the bottom of the uterus; and, by a gentle preſſure, could force out a few drops of it from the ſame foraminula, which were ſtill uncloſed, and ſufficiently conſpicuous. Littre alſo, by very circumſtantial obſervations, proves the flowing of this blood from the uterus; as do alſo Graſſius and Santorini. Of the

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* See Adverſ. Anat. Dec. 3; as alſo his peculiar treatiſe on this ſubject, publiſhed in Holland; and Vater's epiſtle to Ruyſch.

† See Adverſ. Anat. 1. p. 45.

modern writers of reputation, there is only * one who advances that this blood is diſcharged from the vagina alone, not from the uterus. He adds, that he has evidently ſeen this to be the caſe in ſeveral diſſections. From the obſervations of this author, however, which ſeem ſuch as may be depended upon, and for ſome other pretty obvious reaſons, it appears to our author, that nature does not limit herſelf to either of theſe ſources ſingly and invariably ; but that, in ſome caſes, the diſcharge is from the vagina alone, in moſt from the uterus alone, and in ſome from both jointly. In this opinion alſo are Friend, Morgagni, and Vater.

NOTE 33.

The greater number of anatomical and medical writers have joined with Hornius, De Graaf, Steno, Kerkring, and others, in the opinion that the little veſicles, obſerved in the ovaries of women, are real and proper ova, or eggs, in which the firſt rudiments of the fœtus are delineated : but a great many of the more eminent ones, as Morgagni, Vallíſneri, Santorini, Paiton, and Malpighi, not only make a doubt whether theſe veſicles are real eggs, but attempt to prove that the true and real ovula are extremely minute, and are contained in the ſubſtance of thoſe yellow glandiform bodies, and grow ſo as to become by degrees viſible, after impregnation : whereas theſe veſiculæ, tho' uſually eſteemed eggs, in reality decreaſe, not increaſe, after impregnation ; ſerving for the nutrition of the real fœtus, or real ovulum, and promoting its expanſion, its accretion, and its ſeparation. This is a ſubject worthy of the moſt careful enquiry. Notwithſtanding, however, that moſt of the modern anatomiſts and phyſiologiſts have ſubſcribed to the doctrine of the generation of man from an egg, there are not wanting, beſide Diemerbroek, Lamy, and Du Verney, ſeveral who are abſolutely againſt the ſyſtem. Viduſſius † and Voglius ‡, of the Italians, and La Motte § among the French, declare againſt it ; but they have been elaborately

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* Govey's Veritable Chirurg. p. 398.

† See his Motiv. de Dub. Veneze.

‡ See his Anthropogenia.

§ See Diſſertation ſur la Generat. Paris.

ly anſwered by Morgagni *, Santorini †, and Nigriſol ‡, who has wrote profeſſedly and largely on generation; as alſo by Valliſneri §, Paiton ||, and others, who are equally againſt the ſyſtem eſtabliſhed by Lewenhoek, in conſequence of his microſcopical diſcoveries of the generation of the human frame being from the animalcules, which are found living in the ſemen maſculinum of animals. To this we are to add alſo, that a very late writer, Mr. Needham, deſervedly famous for his microſcopical diſcoveries, by ſeveral experiments made in concert with Mr. De Buffon of Paris, as well as ſeveral others of his own attempts, has endeavoured to prove the impoſſibility of the generation of the human frame from theſe animalcules, by proving that they do not exiſt as animalcules in the ſemen, while in the veſſels of the male, or in the due courſe of impregnation; but that they are produced in that fluid, in conſequence of its being expoſed to the air, loſing its texture, and undergoing the ſame ſort of alteration that happens in the infuſions of ſeeds and plants, in which animalcules of the ſame kind with thoſe in the ſemen maſculinum of animals are afterwards found. He obſerves, that the production of theſe animalcules in the male ſemen is very ſudden, and in theſe infuſions is longer about; but that the animals exiſt in neither before the expoſure to the air, and the alteration of their texture. This account is publiſhed in a late number of the Philoſophical Tranſactions: its author eſtabliſhes a very extenſive ſyſtem, a point which does not at all fall under our conſideration here; but if there be certainty in the fact which he aſſerts, it evidently ſerves the purpoſe of this quotation, that is, to prove that the animalculæ in the ſemen do not become the fœtus afterwards.

NOTE 34.

Drake's figure of the Fallopian tube is taken into our Plate 3. Fig. 10. But as our author in the year 1719, in a publick diſſection of a female ſubject, after

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* See Adverſ. Anat. variis in locis.

† See Obſerv. Anatom.

‡ See his Conſider. intorn. della Generat.

§ See l'Hiſtor. de Generat.

|| See Diſcor. della Generat.

having thrown ſome crude mercury into the right ſpermatick vein, the lower part of the Fallopian tube, with the ligamentum latum, being tied, to prevent the mercury making its way into the other veſſels of the uterus, found, and demonſtrated to his audience, a multitude of veſſels, elegantly and diſtinctly purſuing very different courſes from thoſe laid down by authors; a figure of the whole part, as ſeen on this occaſion, is alſo given in the ſame Plate, Fig. 11. It was obſerveable, that after the mercury had, in this beautiful manner, filled the veſſels which thus beautifully and copiouſly ſurrounded the Fallopian tube, it made its way into the cavity of the tube itſelf; whence it is evident, that theſe veſſels communicate with the cavity of the tube, and are deſtined to ſecrete a liquor for the lubricating its inner ſurface.

NOTE 35.

The uterus is the part deſtined by nature for the reception of the fœtus, and in which it is to take its growth and nouriſhment, 'till the time of its birth; but there have been many inſtances of fœtus's receiving nouriſhment and growth out of the uterus: theſe are unqueſtionable; and one firſt thing that is evinced by them is the abſurdity of the old doctrine, that the child was formed in the womb of a mixture of the male and female ſeminal fluids made there. This was an opinion originally of the antients; but too many of the moderns had given into it, till obſervations like theſe, and other ſuch reaſons convinced them. Voglius, in his Anthropogenia, is of opinion, that the fœtus is formed of the very ſubſtance of the womb, by a kind of elongation: this is alſo equally refuted by the ſame obſervation; and it is ſufficiently and plainly proved that the true beginning of the formation of the fœtus is in the ovary; that it is there impregnated by the more fine or volatile part of the ſemen maſculinum; and that, after this, its natural courſe is down into the uterus, which is the place allotted for its reception and nutrition; but that, from different cauſes, it may happen, and ſometimes does, ſo that the impregnated embryo ſtays in its place, or ſtops in its paſſage to the uterus: in this caſe the fœtus ſometimes cannot extricate itſelf out of the ovary; but ſometimes, and that more frequently, it ſtops in the Fallopian tube, where it receives nutrition, and grows to its due period, or nearly ſo: but, in this caſe, it is impoſſible it ſhould be born in the natural way. Magnetus * has given hiſtories of caſes of both theſe kinds; and as to the fœtus's found in the Fallopian tube, Dionis † and Anellus ‡ give ſeveral caſes of them: and experience is continually furniſhing us with more caſes, in which the fœtus has been retained in the ovary. We have the ſame alſo, in Vieuſſens §, Littri ||, and others; and Strauſſius ¶, Bayle **, Saviard ††, Courtial ‡‡, Bianchus §§, and Calvus ||||, give inſtances of the fœtus's in the cavity of the abdomen, as well from themſelves as from the writings of others; but, in moſt of theſe, there is ſome miſtake to be ſuſpected. The French alſo have publiſhed ſome caſes of this kind in the year 1722. To the liſt of thoſe who mention fœtus's receiving their growth in the Fallopian tubes, we are to add Riolanus ¶¶, Elſholtzius *†, Buſſiere *‡, Littre *§, Du Verney *||, and Cyprianus *¶; and a famous example of it alſo from Santorini ⁎*, and another from Paiton. Moſt of the extra-uterine fœtus's are, indeed, lodged in the Fallopian tube; and it is highly probable, that Camerarius's ſtory of a fœtus retained forty-ſix years in the mother, and a multitude of others of a like kind, all have this accident for their origin. The fact is indiſputable, that the fœtus may, and frequently does, receive its growth and nouriſhment out of the womb. Valliſneri has written a treatiſe on generation in the Italian, that is very worthy the careful peruſal of every body who would enquire into this ſubject.

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* Theatr. Anat. T. 2. p. 140. and Bibl. Chirurg. T. 2. p. 131. where the whole is repeated.

† Diſſertation ſur la Generation de l'Homme.

‡ Suite de la nouvelle Method de guerir fiſtules lachrymal.

§ Diſſert. de Struct. & uſu uteri.

|| Memoirs, Paris 1701.

¶ Hiſtor. Fœtus Muſſ.

** Hiſt. Anat. Gravid.

†† Obſerv. Chirurg.

‡‡ Obſ. Anat.

§§ Theatr. Anat.

|||| Anel. loco citato.

¶¶ Anthropograph.

*† De Conceptu tubario.

*‡ See Philoſ. Tranſ. 1694.

*§ Paris Memoirs, 1702.

*|| Epiſt. de Fœtu.

*¶ Obſerv. Anat.

⁎* Diſc. della Gener.

NOTE 36.

It is a queſtion much diſputed among the anatomical writers, whether there be a reciprocal circulation of the blood between the mother and the fœtus. Moſt of them either deny, or at leaſt doubt it: but it is to be obſerved, that Cowper, after injecting crude mercury* into the umbilical arteries of the fœtus, ſaw it enter into the veins of the uterus of the mother. And Vieuſſens, on the other hand, found the mercury, which he had thrown into the carotid arteries of a bitch big with puppies, not only made its way into all the limbs, and all the viſcera of the creature, but reached to the puppies in her uterus; and that all their internal as well as external parts, and even the very cutis itſelf, ſhewed, in a very beautiful manner, the mercury thrown into the veſſels of the parent animal †. Mery alſo confirms this reciprocal circulation, by a very ſingular inſtance in the human frame: it is of a woman who was inſtantaneouſly killed by a fall, in the laſt month of her time. In the diſſection of the body, the cavity of the abdomen was found full of blood; and the blood-veſſels, as well thoſe belonging to the woman as thoſe of the fœtus, which was dead alſo, were all empty. The placenta, all this while, was whole and unhurt, and adhered to the uterus; and there was not the leaſt effuſion of blood in the cavity of the uterus ‡. It were much to be wiſhed, that the author of this ſingular hiſtory had told us what veſſels they were in the abdomen that were broken, and made the effuſion of the blood.

To all this we are to add an obſervation of our author's own, which tends not a little to the ſetting this in a proper light. In a diſſection of a body in publick, before Dr. Wagner and the reſt of the college at Helmſtadt, which was of a woman, who had been big with two children: one of theſe had been brought forth alive; but a violent hæmorrhage of the uterus coming on, the woman had died in a quarter of an hour, not delivered of the other. On the opening the body, at the diſtance of a few hours from the death, the blood-veſſels were found empty; and, on opening the womb, the placenta, which had belonged to the child that was born, was found in great part looſened from the uterus; but that of the other fœtus, yet in the womb, faſt and uninjured: from the ſeparation of the former had doubtleſs proceeded the hæmorrhage, which had killed the woman. After examination of the tunics, or membranes of the fœtus left in the womb, which were yet whole and unhurt, our author proceeded to open the fœtus, to ſhew to his audience the parts different in that ſtate from what they are in an adult; and on opening it, he found no blood in it, either in the heart, or in the larger veſſels: whence he urges, that the blood of this fœtus had paſſed thro' the umbilical veſſels to the placenta and uterus of the parent, and had been evacuated, together with the mother's blood, from the uterus. Rauholt* and Morgagni ‡ are alſo on the ſide of this reciprocal circulation of the blood, between the mother and the fœtus. It appears highly probable, that, in caſes of twins, the veſſels of the placenta do not communicate with one another; tho' the placenta are grown into one, as is often the caſe. Our author prepared two of theſe placenta, thus growing together, into the veſſels of one of which he had thrown a wax injection: theſe were perfectly filled by it; but no part of it had made its way into the veſſels of the other placenta.

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* Anatomy of the Human Body, T. 54. See alſo Act. Erudit. Lipſ. 1699.

† Manget's Theatr. Anat. T. 2. p. 139. The author gives no reaſon for his chuſing to throw in the mercury at the carotids.

‡ See Memoirs of the Paris Acad. 1708. See alſo Mery's account of a fœtus without a heart, 1720.

NOTE 37.

That the fœtus, while in the womb, does really receive nutrition by the mouth, is evident from an obſervation made twice ſucceſſively in the publick ſchools at Altorff. The author had received a perfect fœtus, taken from a cow in the winter-ſeaſon: the membranes were unhurt, and the uterus of the cow was brought with it. The liquor amnii all about the fœtus was frozen; and the ſame liquor, in the ſame congealed or frozen ſtate, was found alſo in the mouth, the œſophagus, and the ſtomach of the calf, forming one continued quantity of ice with that formed of the circumambient fluid, and was about the thickneſs of a finger in the œſophagus. The ſame obſervation he alſo made publick another winter on another fœtus, brought to him at the ſame period, with its membranes and the uterus about it. In this alſo the congealed fluid made one continued body; from the external maſs to the ſtomach of the creature; ſo that there remains no doubt of the liquor, found in the ſtomach of a fœtus about its full period, being the ſame with the liquor amnii; but it is evident that there is communication between them. Nor is it, indeed, probable, that ſo large a quantity of this liquor, as is uſually found in the ſtomach of a fœtus at its full time, ſhould be ſecreted in that part, as moſt authors for a long time ſuppoſed. It appears much more probable, even to reaſon alone, that it muſt have been brought from elſewhere; and it is evident from this ſingular obſervation, from whence it is brought; as indeed might, without this circumſtance, have been gueſſed from the ſimilarity of that found in the ſtomach with the reſt, which ſurrounds the fœtus, all the qualities of which it evidently has.

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* See Memoirs of the Paris Academy, 1714.

‡ See Adverſ. Anat. 4. p. 82.

Fred. Hoffman, in his Diſſertation de Pinguedine, has alſo an obſervation that joins ſtrongly with this of our author's, in evincing this truth. He tells us of a child born at its full time, and in perfect health, the funiculus umbilicalis of which was wholly corrupted and putrid: it is very evident from this, that the fœtus could not have continued alive, if, as is by the generality of writers ſuppoſed, it had received or could receive no nouriſhment, except by the funiculus or navelſtring.

Petit alſo has an obſervation of a child born perfect, and in health, tho' there was a knot in the navel-ſtring, very cloſe, and which had evidently been there long before the delivery. This would have prevented nouriſhment, as uſually, to flow to the child thro' this part; and it is plain, that unleſs it had received, as well as the fœtus in the former inſtance, nutrition by the mouth, it could not have been kept alive. The method

Bellinger has laid down for the nutrition of the fœtus this way, by the aſſiſtance of the gland thymus, we have already mentioned; and there are ſome obſervations on the ſubject worthy notice, in the Acta Eruditor of the year 1718.

NOTE 38.

The uſe of the foramen ovale in the fœtus has been a ſubject of very great and very warm debate among the anatomical writers, particularly between Mery, who, againſt the common opinion, aſſerts that the blood paſſes thro' it from the left auricle of the heart to the right, and Du Verney, Tauvrius, Buſſiere, Sylveſter, Liſter, and Verheyen, who all eſtabliſh the contrary, and adhere to the received opinion. The Memoirs of the French Academy for the year 1699, give the arguments on both ſides much at large, and tend moſtly in favour of the received opinion; but in the ſame works, in the year 1717, we find Winſlow bearing ſtrongly toward the opinion of Mery.

NOTE 39.

Many anatomical writers of great credit abſolutely deny that there is any ſuch interſtice of the mediaſtinum as this: they declare it imaginary, and aſſert, that, if any ſuch is ſeen, it can only ariſe from a violent elevation of the ſternum. But our author does not give up the ſubject: he aſſerts, that he always finds this interſtice, in his diſſections, in the part near the diaphragm; and that tho' the ſternum be elevated as gently, and as little as poſſible only, ſo as to ſeparate the diaphragm from it, by ſuch a gentle elevation as will anſwer this purpoſe, he is clear that no change is or can be made in the parts, nor any thing new, or that was not in the parts before, can be produced in them. It is to be added, that a great many authors of the firſt credit give us inſtances of matter and abſceſſes form'd there; and Maier affirms, that he has frequently found a ſerous humor in it *.

NOTE 40.

Maier, an author quoted in the laſt note, produces, from Muraltus's experiments, an obſervation, that he had found in the thymus a great number of cryſtalline

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* See his Colleg. Anat. Pract. 4to. p. 99.

vaſcula, running to the mediaſtinum, and to the pericardium; and alſo a duct running from it to the tonſils, of a membranaceous ſtructure, and naturally hard *. But it does not appear that there is any ſuch obſervation as this in Muraltus: whether Maier miſtook his quotation, or purpoſely deceives his readers, is not ſo eaſy to determine. There is an appearance of candour in his manner, which would induce one to give it on the more favourable ſide.

NOTE 41.

It has been a matter of much enquiry why the pulmonary artery ſhould be larger than the pulmonary vein, whereas, in all the other parts, the veins are larger than the arteries. Some have ſuppoſed that this is on occaſion of the blood's being more diſſolved in the artery; and that, as it is condenſated again by the effect of reſpiration, it requires a leſs ſpace, in proportion, to return by, than the blood of any other veſſel of the body: but this is but a looſe and vague way of reaſoning. It ſeems rather, that the artery is larger than might be expected here, becauſe the blood, brought back to the heart, finds it difficult, from its thickneſs, to make its way thro' the fine reticulations of the veſſels of the lungs; and the retardation or reſiſtance in this part, may naturally occaſion the trunk of the artery to become diſtended. On the other hand, the blood in the pulmonary vein has no obſtacle, in a manner, to reſiſt or impede its motion, but flows freely and eaſily to the heart; whence a narrower veſſel may ſerve for the paſſage of it, and that veſſel will be in ſcarce any danger of being diſtended beyond its natural dimenſions †.

NOTE 42.

Our author acknowledges, that he had very often ſought in vain for the bronchial veins in human ſubjects; but that he, at length, ſaw them clearly and diſtinctly in a female ſubject: in this he found ſeveral branches running from the intercoſtals to the bronchia, three of

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* See Colleg. Anat. Pract. p. 109.

† See Memoirs of the French Academy, 1718. See alſo Micheſottus and Santorini.

which were particularly obſervable, and were of the thickneſs of a ſtraw. In many other ſubjects, in which he afterwards ſought carefully after them, he did not find them; and obſerves upon the whole, that they do not occur in all, nor are at all determinate in their ſituation when they do. Cowper obſerves, that he had frequently met with one or more of them, running to the ſubclavians *.

NOTE 43.

The auricles and ventricles of the heart have not always the ſame ſize and capacity; the different ages, ſtatures, and other circumſtances in the perſon, making a very conſiderable difference. The right auricle and right ventricle are however, in general, larger than the left; as is confirmed by numerous obſervations of Helvetius, Salzman, Michelotti, and Morgagni. Nicolaus has carefully collected the facts from theſe authors; and Santorini has ſince added ſeveral obſervations on this ſubject, all which join with the others in eſtabliſhing this as a general truth.

NOTE 44.

Lower is the firſt author who has deſcribed this tubercle: it is eaſily ſeen in the hearts of oxen and calves, in form of a fleſhy maſs or eminence; but in the human heart it is not found. Our author, at the ſame time that he acknowledges, however, that he never could find it there, gives a very good account of its having been pretended to be found by others, who would not be ſuppoſed to miſs any thing, whether it exiſted or not. He tells us of a demonſtrator, to whom, in his younger days, he had been pupil; who, having ſearched the proper part of the heart of his ſubject for it, and opened the vena cava, when he found no protuberance where he expected it, took hold of the part where it ſhould have ſtood, and, pulling it up with his forceps, called out to his audience, "Behold, here is the tuberculum cordis of Lower." Our author declares, that, tho' he ſtrictly examined the heart, he was not able to find any tubercle, or the leaſt eminence, either before his pulling up the part, or afterwards; and that afterwards, having ſought carefully after it in

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* See Anat. of Human Bodies.

a great number of hearts, it was never his fortune to find it. Poſſibly, like to this may be the hiſtory of many parts diſcovered by particular anatomiſts, which, tho' demonſtrated to their audiences, no body was ever able to find afterwards. Nicolaus, indeed, very boldly aſſerts, that this eminence or tubercle is larger in man than in the quadrupeds; but there appears nothing to countenance this, on examination. Our author kept many human hearts preſerved in ſpirits purpoſely, to ſhew the place allotted to this tubercle; in all which it was evident, that there never was any ſuch part. To which we are to add, that there is no figure of it in Cowper's elegant and accurate tables of the heart; but, on the contrary, the concourſe of the aſcendant and deſcendent vein is made plain there, as it is indeed always found on diſſection in human ſubjects. The author, with ſufficient reaſon, from all this, omitted the mention of this part, as of one that had no exiſtence, in the firſt editions of this work: he ſeems to have added it in this, by way of ſhewing that it was not thro' inaccuracy that he omitted it before; but he very juſtly does not let it paſs as a reality, notwithſtanding all the great names which appear in ſupport of its exiſtence.

NOTE 45.

Lower, in his account of the ſtructure of the heart, deſcribes a ſeries of ſtrait muſcular fibres, which involve the others under them. Nothing is ſo evident as that there are ſuch in quadrupeds; but there are not wanting anatomiſts, of the very firſt rank, who deny their exiſtence in the human heart. Our author takes a middle courſe: he acknowledges, in conſequence of a multitude of experiments, that they are not nearly ſo numerous in the human heart as in that of many of the quadruped kind; but he declares, that he has always found ſome, and was always ready to ſhew them in his lectures, and that particularly on the ſurface of the left ventricle. To this purpoſe, he had a way of macerating a human heart in water, ſo long as till the external membrane was eaſily ſeparated; after which the fibres, ſo much in diſpute, appear very obviouſly and evidently. A heart thus prepared, he always kept alſo in ſpirits, to ſhew them at all times to ſuch as doubted their exiſtence.

NOTE 46.

Anatomiſts are by no means agreed about the ſituation of the œſophagus, in reſpect to the aſpera arteria. Moſt of the writers on the ſubject have ſaid that it runs ſtrait behind it, between it and the vertebræ of the neck. Morgagni has figured it as inclining a little to the right of the trachea; and, on the other hand, Winſlow will have it ſituated to the left of it. Cant accuſes Veſalius of an error, in having placed the gula behind the trachea; and, at the ſame time, falls upon Morgagni, for having made the œſophagus incline to the right of the aſpera arteria, and refers to the plates of Euſtachius. Our author finds an eaſy way of reconciling theſe jarring authors, by obſerving, that every one of them may have fairly deſcribed what himſelf ſaw, in ſome particular diſſection made for that purpoſe; but that nature varies in the ſituation of this part, in regard to the aſpera arteria, and that it is by no means the ſame in all ſubjects. He aſſerts, that in ſome bodies, publickly diſſected in the ſchools, he has ſhewn it immediately under the other; in others inclining to the right, as Morgagni has figured it; and in others inclining to the left, inſtead of the right. Cant, tho' he refers to the tables of Euſtachius, has not mentioned either the number or figure; but whoever will examine them, will find that Euſtachius has placed the œſophagus behind the trachea: for in T. 41. Fig. 8 and 9. where he has given the trachea, with the gula lying on the right ſide. The gula can ſcarce any otherwiſe appear than as if it inclined to the left, tho' placed behind the trachea. But in his 42d Tab. Fig. 4 and 6. the gula and trachea are figured lying, as plainly as poſſible, on one another.

NOTE 47.

Vercellonius, in his book intitled A Medico-anatomical Diſſertation on the Conglomerate Glands of the Oeſophagus, deſcribes ſome new excretory ducts, terminating in the œſophagus: they are numerous, and, according to his account of them, not very difficult to be diſcovered, on a proper examination. He aſſerts, in

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this treatiſe, that the buſineſs of digeſtion had never yet been truly explained or underſtood by the medical writers; and that, becauſe they never had found out the true digeſting fluid; and this, he aſſerts, is poured into the ſtomach and the œſophagus by a multitude of very fine ducts: 1ſt, from conglomerate glands, ſituated on the left of the ſtomach; 2d, from the dorſal; and, 3d, from the bronchial and tracheal. But from the thyroide gland, which is to be ſuppoſed a nidus of the ova verminoſa, he alleges theſe ovula verminoſa are tranſmitted to the ſtomach and œſophagus, and give a vital power and character to the chyle. Of all this the author of this work treats at large in the Adenologia. It may be ſufficient to mention it here.

NOTE 48.

The author has already obſerved, that nature varies greatly in the ſinus's of the dura mater, and that the fourth is often wanting. It is to be obſerved alſo, that the left lateral ſinus, according to the obſervations of Morgagni, frequently begins from the right, not from the longitudinal one, as is uſually ſuppoſed*. The ſinus falcis, which is by many called the inferior ſinus, appears to have the leaſt of all the title to the name of a ſinus: its coats are thin as thoſe of the other veins, and its figure is not angular as that of the other is. Morgagni has obſerved alſo, that he had found the lateral ſinus's communicating with one another by means of a tranſverſe canal†. Our author joins in the aſſertion, and obſerves, that himſelf had found ſuch a canal of communication; and it is figured here in Tab. 7. Fig. 32.

Rivinus alſo, in his treatiſe on the defects of hearing, mentions a tranſverſe ſinus, which is evidently the ſame with this of Morgagni and our author.

NOTE 49.

There are not wanting authors who deny the exiſtence of the rete mirabile in the human frame: Nicolaus has collected their ſentiments‡. But nothing of this kind is more wonderful than that Ruyſch, who had before found deſcribed, and even figured this *, ſhould, in his later writings, treat it as an imaginary part †. Our author is confident, from repeated experiments, that if the dura mater be carefully opened with a ſcalpel each way, near the pituitary gland, the rete mirabile, however much its exiſtence may be doubted by very great men, will appear obviouſly and evidently enough to every body.

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* Adverſar. Anat. 6. p. 2.

† Adverſ. Anat. 6. p. 3.

‡ Diſſertat. de Direct. Vaſ.

NOTE 50.

The old writers have given it as their opinion, that the cryſtalline humor of the eye was the primary organ of viſion; but of later times the nervous tunic, called the retina, has been univerſally allowed to be ſo. This opinion agrees perfectly with all the optical experiments, advanced as the teſt of truth in this diſquiſition; and moſt of the medical as well as mathematical writers, after the days of Des Cartes, have agreed to it. Marriot, however, a very celebrated mathematician, diſſents from this univerſally received opinion; and will have the choroides to be the primary and principal organ of this ſenſe ‡: he brings a multitude of experiments in ſupport of his opinion, and argues with great regularity and exactneſs from them. Mery falls into this opinion alſo, and has brought a number of additional experiments to the ſupport of it §: and with him alſo De Mayran ||, and Mr. de St. Yves ¶, a celebrated occuliſt, add their teſtimonies of facts, and their reaſons in ſupport of the new doctrine.

But, in oppoſition to all this, it is to be urged, that in all the other ſenſes the primary organ of perception is a nerve; nor does there appear any reaſon why nature ſhould depart from her courſe in this, which is the moſt delicate of all the ſenſes. Now the retina is merely an expanſion of the optick nerve in the eye; and it ſeems ſomething raſh to thruſt this part, ſo well calculated for the purpoſe, out of its office; and to give

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* Epiſt. Problem. 12. T. 13.

† Adverſar. Anatom. 2. p. 45.

‡ Nouvelle Decouvertes touchant la Vue.

§ Memoirs of the Paris Academy, 1704.

|| Diſſertat. de Cauſa lucis Phoſphor.

¶ Traité des Maladies des Yeux.

ſo great a power to membranes, much leſs likely to be endued with the exquiſite ſenſe neceſſary on ſuch an occaſion.

NOTE 51.

Our author has been attacked on account of his doctrine of the eye, and particularly on his opinions as to the glaucoma and cataract by ſeveral of his cotemporaries. The grand point to be determined was, whether there is more of the aqueous humor in the anterior or in the poſterior part of the camera; that is, whether there be a greater quantity of the aqueous humour between the cornea and uvea, or between the uvea and cryſtalline lens. The people who were againſt our author's ſyſtem, advanced that there was more of it in the hinder part; but the author, that there is more in the anterior camera. It appears, on a candid and impartial enquiry into the caſe, that the principal of our author's adverſaries had taken up his notions of the eye, not from diſſection and obſervation, but from the figures in books; and, indeed, to the ſupport of ſuch an hypotheſis, ſuch a conduct was neceſſary enough: but it is to be obſerved, in regard to this, that moſt of the anatomical as well as of the optical writers, have made the ſpace between the uvea and cryſtalline much larger than it is in nature. They have often figured it larger than that which is between the uvea and cornea; and very few of them, indeed, have made it leſs * than equal to it in magnitude. But our author, whoſe great character it is to have been determined by his own obſervations, not by the writings of any body, tho' he had long before aſſured himſelf by a great number of experiments and obſervations, that there was a larger quantity of the aqueous humour in the anterior than in the poſterior camera; yet, on the occaſion of this diſpute, determined to enter a-new on the diſquiſition, and to make diſſections with the utmoſt preciſion; and to have draughts taken from them, which ſhould be more to be depended on than

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* See Stephanus's Diſſect. Part. Corp. Hum. p. 303. Des Cartes in his Dioptricks; Scheiner in his Fund. Optic. Newton's Opticks; Hartſeker's Dioptricks; and Verheyen, T. 27. fig. 5. See alſo Rohault's Phyſicks.

ſuch as were already extant, and had evidently led people into errors; and this he judged the more neceſſary, as not only tending to put a final end to the controverſy he was engaged in, but to eſtabliſh the truth in a point where it was much wanted, as few authors had come near the giving the true ſituation, proportion, &c. of the humors of the eye *.

But as in recent, and not conglaciated eyes, the efflux of the aqueous humor in the diſſecting, and the conſequent collapſion of the coats or tunics, render the ſituation of the humors impoſſible to be accurately ſeen, and make it impoſſible therefore to form an accurate judgment of them, he thought it a neceſſary precaution to expoſe the eyes, to be diſſected, firſt to the cold air of winter's nights, that they might be frozen. In eyes thus prepared for opening, on going carefully and regularly thro' the diſſection, the parts will all be found in their juſt and natural ſituation, and dimenſions.

The author began his own experiments, which were very numerous on this occaſion, on the eyes of quadrupeds; and engaged correſpondents at Nuremberg, Altorff, and other places, to diſſect the ſame parts with the ſame cautions, in concert with him. In all the eyes they experimented upon, after cutting them thro' the axis, the cryſtalline was found to come very near the uvea, and a very ſmall and ſcarce perceptible quantity of the aqueous humor was found between the cryſtalline and uvea: but, on the other hand, there was always found, between the uvea and cornea, a much larger quantity of the aqueous humor; in general, at leaſt four times as much as in the other cavity. This was generally the caſe in all the experiments made on this occaſion. The figure in T. 4. Fig. 18. is from the eye of a hog: it ſhews the real ſituation of the parts, and evidently enough proves the truth of this doctrine.

Our author was very intent upon examining the human eye, under the ſame circumſtances; but not having the opportunity of a ſubject, during the ſhort time of the froſt of the winter, when he had intended

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* See Fabricius ab Aquapendente de Viſus Organo, c. 8. See alſo Mariot's de Viſu, fig. 3; and Bidloo de Oculis & Viſu, p. 3.

it, he wrote to Morgagni, who had always bodies at command, and requeſted him to experiment, and to give him the reſult of his obſervations, and a figure of the parts as he found them. Morgagni's anſwer was, that he always, without one exception, had found a much greater quantity of the aqueous humor between the cornea and the iris, than between that and the cryſtalline. The draught he made of the parts, as he found them in a frozen human eye, is given in our 4th Plate, Fig. 19.

After this our author had himſelf an opportunity of expoſing to the froſty air an eye of a human ſubject, who had died a violent death. On diſſecting this afterwards in the publick ſchools, he demonſtrated, to a large audience, that there was ſcarce any of the aqueous humor between the iris and cryſtalline, tho' there was a conſiderable quantity of it between the iris and the cornea. The diſſection of this eye agreed in all reſpects with the account and the figure ſent by Morgagni; and after this, both the author and others taking the opportunity of froſty weather, when they had human ſubjects before them, demonſtrated the ſame thing many times to different audiences. Figures were taken from the author's diſſections of theſe eyes; but he prudently chuſes to preſerve, in this work, thoſe he was favoured with by Morgagni, as a perſon, at once, of unqueſtioned judgment, and not engaged in any diſpute on the ſubject. What our author has ſaid farther on the ſubject, is to be ſeen in the Ephemerides, Cent. 7 & 8.

Evident as what has been delivered on this ſubject appeared, however, to the candid world, Wolhuſius, in a very ſevere and harſh manner, has raiſed objections againſt it in ſeveral of his writings; and has not even ſpared ill language, when his reaſonings are not of force enough. Our author has not omitted to anſwer his objections, and, in that anſwer, occaſionally to charge him with errors and plagiariſms, in ſuch a manner as he was notable to acquit himſelf of: nor, indeed, were the world inclined to think well of him, from the coarſe and abuſive manner in which he attacked both this author, and many others of eſtabliſhed reputation *. Our

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* See Memoir. Trevolt. 1725.

author's apology is a ſufficient anſwer to every objection ſuch a writing as this could be able to ſtart; nor, indeed, was it worth his while farther to attack an adverſary of this ſtamp, while Winſlow, Morgagni, Petit, Renaume, St. Yves, Morand, and Senac, who tranſlated this author's work into French, and commented largely upon it, all join in his opinion. It may not be improper, however, to give a ſpecimen or two of the manner of reaſoning of this wild author. His firſt and great argument is, That the globe of the eye increaſes in bulk, all the way from the convex part of the cornea to the centre of the eye; and that, therefore, the poſterior camera of the eye muſt be larger than the anterior. But all that the judicious reader will be able to make out by this is, that the perſon who ſays it is but very ill informed of the ſtructure of the eye. The argument would indeed be true, if the eye were a hollow ſphere, filled only with a fluid; or, if the ciliary ligament were longer, or more remote from the cornea: but as, in reality, this, with the cryſtalline, is placed as a wall or incloſure, and allows but a very little room to the poſterior camera, as is evident from Morgagni's figure given here, T. 4. Fig. 19. it is clear enough, that this argument does not prove all that its author would have it; but, on the contrary, it appears from the knowledge of this true ſituation of the uvea, the ciliary ligament, the cryſtalline, and the vitrous humor, that the poſterior camera is not augmented in ſize, nor does become larger than the anterior, altho' the eye do increaſe in its dimenſions toward the centre.

He attempts to ſtrengthen his argument by the obſervation of the quantity of matter, which is ſometimes found behind the uvea in a hypopion; but this is of all arguments the moſt fallacious and uncertain. Every body knows how much a part, in a diſtempered ſtate, may differ from the ſame part in its natural one; and add to this, that there is no diſtempered ſtate which will alter and diſtend the parts it affects ſo much as a lodgment of matter in them. This, indeed, the objector is, in another place, obliged to acknowledge himſelf; and from this, and ſome other ſuch inſtances, which might be quoted, it appears plainly enough, what credit ought to be given to the obſervations on the ſtructure of the eye made in morbid caſes, and in conſequence of chirurgical operations. It would be as eaſy to anſwer all the other arguments of this author, and moſt of them in the very manner of this, but it is not our buſineſs here to enter into the diſpute. Thus much it was not improper to ſay, in regard to ſo heavy and at the ſame time ſo unreaſonable an attack upon the author's reputation. After this the deciſion may be left to the reader's judgment; or, if he want farther argument in favour of our ſide of the queſtion, he may turn to a paper of Winſlow's on the ſubject, in the Memoirs of the Paris Academy for the Year 1721.

NOTE 52.

How, in his treatiſe on the circular motion of the fluids of the eye, has deſcribed, under the new name of nervo-lymphatica, certain very ſmall blood-veſſels in the eye, which do not carry a red but a lymphatick blood, and which Ruyſch has long ſince alſo deſcribed and delineated. But where is the neceſſity of a new name for theſe veſſels was, is not eaſy to diſcover, any more than, if it had been judged neceſſary, why the term *nerve* ſhould be uſed in the formation of it; ſince nothing is more evident, than that theſe veſſels are all produced from veins and arteries, and have been called accordingly by others lymphatick arteries and lymphatick veins, or arterioſo-lymphatick veſſels. Our author, very judiciouſly, excepts againſt the name, as one that would be apt to give very wrong ideas, particularly to people juſt entering on their ſtudies: nor is it proper, after having mentioned this author, to leave his work without ſome more animadverſions. He ſays, 1ſt, That the tunica choroides is diviſible into five diſtinct tunics or coats; but we are very apt to queſtion whether this be a fact, in regard to the human eye, eſpecially as it is evident, from his own words, that, on account of the difficulty of obtaining human ſubjects, the greater part of his experiments were made on the eyes of brutes. 2. He denies that there are any muſcular fibres in the ciliary proceſſes and ciliary ligament: he thinks what are uſually eſteemed ſuch, are veſſels; but to this we are to anſwer, that the greateſt anatomiſts of this time are all agreed, that all muſcular fibres are hollow or vaſcular; ſo that, by the ſame argument, he may prove that there are no muſcular fibres in the whole body, which, we are apt to believe even himſelf will allow, would be ſomewhat abſurd. The natural ſtructure of a muſcle does not argue at all againſt this vaſcular ſtructure: the great uſe is in contraction and dilatation. The actions of contraction and dilatation are evident in the pupil; and nothing is more certain, than that we ſee in the ciliary proceſſes fibres, in all reſpects agreeing with muſcular ones, which have loſt the office of veſſels as well as the habit and appearance of them; and there can be no doubt, therefore, that theſe truly and properly are and ought to be eſteemed muſcular fibres. In another place the author calls the ſubſtance of the uvea muſculoſo-membranaceous; and afterwards he aſſerts, that the vaſa adducentia of the eyes come from one and the ſame origin, namely, from a branch of the internal carotid; but that not admitted into the cranium, as Nuck aſſerts, but beſtowed on the orbit of the eye. To this we are to anſwer, that in human ſubjects theſe veſſels do really and truly run out of the cranium to the eye. He afterwards aſſerts, that the ductus arterioſus of Nuck, coming out of the cranium, is not the ſource of the aqueous ducts; for that it is too ſmall. To which we are to anſwer, that it is not, indeed, the only ſource of them; for that it communicates by anaſtomoſis with other of the branches that run to the eye.

He agrees with Mariott and others, that the tunica choroides is produced from the pia mater; but he does not prove this: and, on the contrary ſide, it may be alledged, that this tunic is of a colour, figure, conſiſtence, and nature wholly different from that membrane; and that nothing is more evident, than that the other membranes of the body were formed at the ſame time with the pia mater, but do not owe their origin to it.

He afterwards ſays, that the cryſtalline conſiſts of pellucid nerves; but, in regard to this aſſertion, one would aſk, why he may not as well join with other writers in ſaying that it is compoſed of pellucid veſſels?

In another place he tells us, that the gluten in the blood cannot be reſtored without the aſſiſtance of a new acid, and that this neceſſary acid is only ſecreted in the glands; but this is a bare aſſertion: he has done nothing towards proving it; nor probably had he attempted to prove it, would he have found it in his power. He afterwards obſerves, that the conglomerate glands have no inferent veſſels: but this is an aſſertion that flies in the face of all reaſon, and all experience; for nothing is more certain than that there are inferent veſſels to them; and it is equally certain, that, if there were not, nothing could be ſecreted in them. In another place he tells us, that the circulus venoſus is ſix or ſeven lines diſtant from the ciliary ligament: but, unluckily for this aſſertion, the whole body of the eye is but about ſeven lines in diameter; and this circulus is as near as is well poſſible to the ligamentum ciliare. He has expreſſed himſelf, as he thinks, very circumſtantially, by adding the epithet *mathematical* to his term *line.* If he means by the word that part of an inch which mathematicians mean, when they uſe the term *line* as a denotative of meaſure, which is as we have underſtood it, it is certain that he knew nothing of the ſituation of the parts: if he means by it the mathematical definition of a line, which has neither breadth nor thickneſs, it is not eaſy to underſtand what he could intend by expreſſing the diſtance of two bodies by meaſures which are of no diameter, nor expreſs any meaſure at all. It is moſt probable, that he did not underſtand what a line was.

He, in many places, affects to call the arteries fontes oculi; but what neceſſity could there appear to him for a new name on this occaſion? Or, to what purpoſe is it to multiply things, when there is not a diſtinction to be preſerved by it? He, in another place, calls the internal angle of the eye the canthus minor, or leſſer canthus; which is at once contrary to fact and reaſon, and to the joint conſent of all the authors that ever wrote upon the ſubject.

So much notice would not have been taken here of the errors of an author of this ſtamp, were it not a kind of debt to ſo eminent a writer as Ruyſch. This author has written very ſeverely againſt Ruyſch, at the ſame time that he has borrowed, or, to ſpeak more juſtly, ſtolen what is of value in his book principally from him; and, according to the cuſtom of the authors of this ſtamp, he very modeſtly tells us, that he had never read his works. How much probability there is in this, when the author himſelf is a Dutchman, and his work evidently founded on that of Ruyſch, every reader will determine for himſelf.

NOTE 53.

In regard to the inſertion of the optick nerve, it may be proper to obſerve, that tho', to a perſon who curſorily views the eye taken out of its orbit, and cleared from the muſcles and fat, it appears as if inſerted directly into the middle or centre of the poſterior part of the eye; yet it does not enter the eye, as Brigs aſſerts in his Ophthalmographia, directly oppoſite to the pupil, but on each ſide, nearer the noſe: and this is a very obvious precaution of nature, or otherwiſe the rays of light would, in their paſſage from the objects, fall immediately upon the nerves, with which the arteries are joined. The pupils of the two eyes are, in general, nearly three inches diſtant from one another; but the foramina of the cranium, thro' which the nerves paſs to the orbits, are ſcarce ſo much as one inch diſtant*. The part of the eye where the optick nerve enters is perfectly dark and blind, as Mariott has very evidently proved by experiment †: and it is an evident conſequence of this, that if the nerve entered the eye directly oppoſite to the pupil, at which the rays from illuminated objects enter, many of thoſe objects would fall immediately on it, and conſequently would not be ſeen; but the precaution of inſerting the nerve rather laterally toward the noſe, wholly prevents that defect.

NOTE 54.

There are ſufficiently numerous proofs, from chirurgical obſervations, that a very large quantity of ſaliva is diſcharged from this duct, and that particularly during the time of chewing. Fabricius ab Aquapendente[*] obſerved, firſt, that in wounds of the cheek, toward the ear, there appeared a little aperture, ſcarce diſtinguiſhable to the naked eye; out at which, eſpecially while the patient was eating, there iſſued a great quantity of a limpid fluid, in the manner of tears: but he acknowledges, that what it is, or how or whence it flows, he is ignorant; nor is this wonderful, as the ſalival ducts were not diſcovered in his time.

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* See Boerhaave's Inſtitut. cap. de Viſu. Alſo Winſlow, in the Memoirs of the French Academy, 1721.

† See Nouv. Decouvert. touchant la Vue. See alſo De la Hire, Boerhaave, and Stancarius, who all confirm what this author advances. Our author alſo tried the experiment, he tells us, in the night with a candle, and found the place, when the candle itſelf diſappeared.

Helvetius afterwards affirms, that the quantity of this fluid ſecreted in this gland is ſo great, that a ſoldier having received a wound in his cheek, in which the ſalival duct was cut, he for a long time wetted ſeveral cloaths, at every meal, with the quantity that was diſcharged from it while he was eating [†].

Our author tells us, that himſelf had alſo met with ſeveral of the like caſes, as have alſo many others; in all which, if this duct have been cut thro', the conſequence has been the ſame. It appears from this, how erroneouſly they talk who deny that the motion of the jaw, in chewing, has any effect in the ſecretion and diſcharge of the ſaliva; and would give all the merit of that neceſſary ſupply to what they deſcribe under the name of the anima. It is ſurely much more philoſophical, as well as anatomical, to find out the material cauſes of the effects we ſee produced, where that may be done.

NOTE 55.

Steno [‡] was the firſt author who diſcovered that the glandulæ ſublinguales had, on each ſide of the tongue, excretory veſſels, very ſhort and very ſlender, placed parallel to one another, and ſcarce diſtinguiſhable, unleſs they were preſſed or ſqueezed: he obſerved them in quadrupeds. After him Verheyen [§] took the liberty of uſing the very words of Steno on the ſame occaſion, deſcribing the ſame veſſels, but without mentioning Steno's name. Our author, who had followed ſome of the greateſt men in this way in his ſtudies, and had ſeen them ſearch after theſe excretory veſſels in vain, and who had afterwards ſought after them in vain alſo in human ſubjects, had at one time perſuaded himſelf that they were peculiar to quadrupeds, and were indeed not to be met with in the human frame at all; but he was afterwards convinced, that they are really to be found in the human tongue, by Morgagni, who not only wrote to him on the ſubject, but afterwards printed his diſcovery of them, aſſerting, that there are, in reality, a great number of theſe veſſels on each ſide, which ariſe from the exterior ſides of the ſublingual glands, and do not bend their courſe forward, but tranſverſely toward the gums; and that, at a ſmall diſtance from the glands, they have little oſcula or openings of a peculiar form, ſome of them large enough to admit a fine briſtle into them. Our author, who is never above owning that he has been miſtaken, and has amended of it, adds, that, after this clear and accurate deſcription, he ſought for them again in human ſubjects, and, after ſome difficulty, found them.

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[*] See his Chirurg. de Genarum Vulner.

[†] See Memoirs of the Paris Academy, 1719.

[‡] See his Obſ. Anat. de Gland. oris.

[§] Anat. Tract. 4. c. 20.

In the mean time alſo Walther, phyſician to his Poliſh majeſty, and a profeſſor of anatomy at Leipſick *, wrote a treatiſe expreſly on the ſubject of theſe ducts, in which he deſcribes them at large, and figures them from a human ſubject: he is the firſt author that has done ſo. He mentions eight of them.

It is not in all ſubjects that theſe minute objects of the anatomiſts reſearches are equally to be found: in ſome they are ſcarce poſſible to be diſcovered, in others it is hardly poſſible to miſs them. Our author, who had ſo long been ſearching in vain for them, when he found them, examined many ſubjects afterwards, in which it was difficult to trace them; but, at length, he met with a ſubject, in which they were much larger and more numerous than he had ever before ſeen them. He made a careful preparation of the part, and cauſed a figure to be engraved of them, exhibiting thoſe of one ſide perfect, with the tongue yet cohering with the lower jaw. See Tab. 7. Fig. 33.

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* Exercitat, de Lingua, Lipſ. 1724.

NOTE 56.

The foramen cœcum of the tongue, which is uſually ſmall, is ſubject to great variation in its ſize. Our author, in the ſame ſubject in which he found the ducts mentioned in the former note ſo very obvious, found alſo this foramen ſo large and deep, that he, without difficulty, introduced into it a tube ſo large, that he had been uſed to preſs it into the ureters, for the inflation of them, and even for the inflation of the bladder. On blowing into the tube, when introduced into the foramen, in order to diſcover the duct mentioned by Vater, he found that the poſterior part of the tongue was very remarkably diſtended by it. Not ſucceeding ſo well in this, however, as he had expected, he threw in an injection of a waxy matter, coloured red, in order to ſee its true ſituation, form, and courſe. This ſucceeded ſo well, that afterwards, on opening the foramen cœcum in the tongue, ſee Tab. 8. Fig. 34. he immediately diſcovered the beginnings of two very remarkable ducts, not deſcribed by any writer: theſe continued their courſe about a line depth, under the teguments of the tongue. After carefully removing theſe teguments, he found theſe ducts continued, one on the right ſide, and the other on the left, running on, as expreſſed in the figure. The left duct, marked by the letter *b* in that figure, continued its courſe to the tubercle *c c*, which was a pellucid veſicle full of a clear liquor, looking like the ſaliva. Our author judges, with great probability, that this liquor was protruded into the veſicle by the force of the matter of the injection; and that the veſicle is not a natural appearance in the part, but was merely the end of the duct, forcibly diſtended by the liquor thus protruded, which, having no way out, and being thus puſhed into it with a force it could not reſiſt, dilated its ſides, and formed the poſterior part into the appearance of a diſtended bladder. In the other duct there was only a little of the injection found, in the beginning; but on taking this out, and introducing a pipe, and blowing into it, the inflation reached as far as the part marked with the letter *e* in the figure: ſo that, from the letter *d* to *e*, the duct ſhewed itſelf to be of the ſame nature and ſubſtance with the ductus ſalivalis

Whartonianus; and at the end of this there was no veſicle, like that of the other ſide; which tends alſo greatly to corroborate the opinion, that the veſicle there was not natural, but formed as already ſuggeſted. Theſe ducts therefore in this tongue, in which they were ſo particularly diſtinct and obvious, appeared evidently to be ſalival ducts. But as, beſide theſe ducts, there were very evidently diſtinguiſhable three little apertures or oſcula in this foramen, expreſſed by the letters *g g*, whoſe cavity ran downwards, and did not admit the ſmall ſtyle introduced into them much more than a line deep, he alſo readily agrees with Morgagni, Vater, and others, that this foramen is either an excretory duct of the lingual glands, or a place of concourſe of a great number of glands, which diſcharge the ſaliva into the mouth from the glanduous ſubſtance of the tongue. But theſe ducts, if the large foramen happens to be wanting, as is indeed very frequently the caſe, open themſelves a paſſage into the mouth, by a number of leſſer diſtinct apertures; and it appears, from repeated examination, that nature varies extremely in this circumſtance. What is farther obſervable in the figure mentioned in this note, will be pointed out in the annexed Explication. Our author is of opinion, from repeated experiments, that the ducts deſcribed by Coſchwitz, under the name of new ſalival ones, and figured as ſuch by this author, and by Kulm *, Du Verney †, and others, are in reality no other than veins.

NOTE 57.

The ſame ſubject, which gave the author an opportunity of expreſſing the parts treated of in the two preceding notes in ſo happy a light, furniſhed him alſo with another obſervation: he found, near the hinder dentes molares of the upper jaw, between the muſculus buccinator and the maſſeter, two remarkable conglomerate glands, one on each ſide, of the ſize and figure repreſented at the letters *f f f f* in fig. 36. Theſe, from their ſituation, he calls the glandulæ molares. In each of theſe he diſcovered two large oſcula or apertures, of twice the ſize of the punctula lachrymalia, and eaſily admitting the thick briſtles figured at *gggg*, and even the ſtyles uſed in the fiſtula lachrymalis: they admitted theſe to about two lines.

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* Tab. Anat. Germanice Edit. Gedani 1725, T. 12. b.

† See his Diſquiſit. Anatom. de Duct. Saliv. Tubing. 1725.

Beſide theſe larger oſcula, there were alſo, on the left ſide of each gland, two or three other ſmaller foraminula; tho' theſe were not ſo minute as the apertures of many other of the parts of this kind: all theſe pierced the membrane of the mouth, and the buccinator muſcle; and, on preſſing the gland gently, each of them diſcharged at its orifice a drop of clear ſaliva. The 37th figure gives a view of the external part of the gland of the left ſide, which is ſeen by it to be compoſed of a number of ſmaller ones; and hence, in ſome degree, to reſemble the ſhape of a mulberry: from this it is evident, that it is of the number of the conglomerate glands. It adhered to the ſubſtance of the palate, where the laſt of the dentes molares terminated.

Such is our author's deſcription of theſe two remarkable glands, as he found them in this ſubject. Whether they are univerſal, or are found in the ſame figure and ſituation, and with their apertures or foramina in the ſame ſize, number, and ſituation in other ſubjects, he does not determine.

NOTE 58.

As the author was employed about the ſame fortunate ſubject, in examining the tubæ Euſtachii, and muſculi Columellæ, he chanced to preſs with his finger on the upper part of the pharynx, and on the part of the thick membrane marked with the letter *b* in our 38th figure, which, in that part, inveſts the lower extremity of the great apophyſis of the os occipitis; where, from the part marked with the letter *a*, near the upper part of the vomer, he obſerved a mucous but not pellucid liquor ouze out. As he afterwards purpoſely preſſed that and the neighbouring parts, he always found the ſame humor flow out. Determined to examine what aperture of a duct into the mouth this was, he firſt attempted to introduce a ſmall ſtyle anteriorly and ſideways; but in both attempts he failed of ſucceſs: but afterwards making the ſame attempt toward the hinder part, in a direction to the great foramen of the occuput, he ſucceeded ſo far as to introduce it with great eaſe to the depth of a finger's breadth; that is, as far as to the part marked in our figure *b*. Finding afterwards that the paſſage was wide enough to admit a larger ſtyle, he introduced ſuch a one as is figured at the letter *f*, and this penetrated as eaſily as the other to the ſame depth: after this he inflated it by means of a tube; but its ſubſtance was ſo denſe and firm, that he was able to dilate it but very little by this means. But, from time to time, he found himſelf able to expreſs a very conſiderable quantity of the mucous liquor beforementioned thro' it. After theſe obſervations he opened the paſſage, and found that it ran from its aperture expreſſed at *a*, to the depth at *b*, amidſt a denſe glandular ſubſtance, every way ſurrounding it toward the great foramen of the os occipitis, under the apophyſis.

He at firſt ſuſpected that it might be a morbid opening in this ſubject, or an ulcer in the part, and wholly preternatural; and he was the more inclined to this ſuſpicion, from the circumſtances under which the patient died: for, beſide the other ſymptoms of the diſeaſe that carried him off, he had, toward the end, an inflammation of the fauces. This circumſtance pleaded much againſt the author's ſuppoſing what he had diſcovered a real and natural aperture, eſpecially as he candidly acknowledges, that at that time he had not met with an account of any ſuch part, in any writer on the ſubject. Afterwards, however, turning over Santorini *, he found a paſſage where that author is ſpeaking of the fornix of the pharynx, under which term he includes the part which is repreſented in our figure, between the poſterior extremities of the noſtrils, the Euſtachian tubes, and the great foramen of the os occipitis; concerning which he ſays, that it is covered with a denſe and thick membrane, full of a number of glands, from which a thick mucous matter is diſcharged. Theſe, he ſays, he ſometimes found opening themſelves into ſhallow cavities, which were, in ſome ſubjects, arranged in a kind of regular order; in others they were diſtinct and ſeparate: ſometimes he found inordinate and quite irregular loculi; ſometimes the whole cavernous, as it were, full of conſpicuous apertures and deep ſinus's, ſo as to emulate in ſome degree the tonſils; and that it was eaſy to preſs out a mucous liquor from theſe. From this account of Santorini it is evident, that what our author obſerved in this ſubject was not a morbid ſtate of the parts; but that ſuch a mucous matter is always naturally thus ſecreted and diſcharged in this part. Whether it is protruded out at ſeveral apertures, or only at one, as in the ſubject in which our author obſerved it, which ſeemed a common canal, into which the glandulous circumjacent ſubſtance pour'd the matter of its ſecretion: its office is evidently to lubricate the fauces, to make the food paſs down the gula with more eaſe, and to aſſiſt in forming the ſweetneſs of the voice. It is alſo highly probable, that Santorini is in the right in judging that in a morbid ſtate, when this mucous matter is ſecreted in too great abundance, the great quantity of ſuch matter that the patient thinks diſtils from his head, and which he ſo freely voids in ſpitting, is really the produce of theſe glands.

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* Obſervat. Anatom. p. 137.

NOTE 59.

Our author in his laſt diſſections, before the publication of his laſt edition of this Compendium, took very conſiderable pains to ſearch after the duct named from Steno, and running from the noſtrils into the palate, behind the dentes inciſores; but tho' this muſt be acknowledged to be very manifeſt in the head of a ſkeleton, it is certainly very obſcure in diſſection of the freſh body. There are always found, indeed, behind the dentes inciſores, a number of rugæ and foveolæ, or depreſſions; but the author aſſerts, that, in all his attempts, he never was able to make out any duct or canal running thence to the noſe, either by means of a briſtle, or of the fineſt ſtyles, tho' he uſed ſuch of the latter in the attempt as eaſily paſſed into the punctula lachrymalia. After cutting thro' the rugoſe membrane of the palate, indeed, in this place, he found he could introduce the ſtyle into a boney canal, near the membrane which runs thro' this canal; but that this only penetrated a little way, and could by no means be continued to the noſe. And, on the other hand, on trying to find a paſſage thro' from the noſe into the mouth, the attempt was as fruitleſs; not even the fineſt ſtyle, or the ſmalleſt briſtle, being able to make its way. From all this our author ſuſpects, that this membrane, which is a very ſtrong one, is in reality a ligament, ſerving to connect and ſtrengthen the membrane of the palate, that it may not be ſubject to be ſeparated from the bones of the palate by any hard parts of our food, or by other accidents; ſince, in that caſe, it would be an inconvenience from which many bad ſymptoms would riſe, and which, tho' it might eaſily have happened without this defence or prevention, is very well ſecured from it by ſuch a connection.

NOTE 60.

Rivinus has deſcribed this foramen, which has been ſince called after his name. The hiatus Rivini is ſituated in that part of the tympanum, where the cord is, and where the handle of the malleolus is joined to its head. Thus it is that Rivinus has deſcribed and figured the place where it is ſituated; and Teichmeyer, who formerly had been a pupil of Rivinus's, agrees in this: but others deſcribe it in a different manner, and its ſituation different. Among the lateſt of the writers of note, who are for the latter ſide of the queſtion, we are to mention Mr. Cheſelden, who affirms, that the membrana tympani, in that place where the boney circle, to which this membrane of the tympanum grows in infants, is not intire; but that it is open, in proportion as this circle is deficient. This is his account in his firſt edition of his Anatomy; but in the third he ſays, there is only a little aperture in this place, and that it is covered with a valve. He acknowledges, however, in the firſt, that this aperture is different in different people; and that in ſome it is ſo large, that it will let air enough thro' to put out a candle, on preſſing the air from the mouth, when ſhut, thro' the Euſtachian tube and external ear. And adds, that he had met with a man who would ſmoak a whole pipe of tobacco, without diſcharging any of the ſmoak out at his mouth, throwing it all out thro' his ears; and that this man had his ſenſe of hearing very quick. He tells us alſo, that he once, in a diſſection, found this membrane open in half is diameter, and yet that the perſon was not deaf. He finally tells us, from the authority of

St. Andre, of a man in whom the whole membrana tympani was deſtroyed by an ulcer, and the officula auditus thrown out; and yet, that the man did not loſe his hearing by it.

It is eaſy to conceive, that, if this accident had happened to one of the perſon's ears only, he might continue to hear with the other; and, by the account, we are not informed whether it was to one or to both ears that it had happened. Our author aſſerts exactly the contrary of what this inſtance is cited by Mr. Cheſelden to prove; and declares, from his own knowledge, a caſe, in which a perſon having loſt theſe bones or officles abſolutely and entirely, loſt his hearing with them. We are to add, that Munnicks, in his Liber de re Anatomica, and Valſalva in his Account of the human Ear, aſſert, that they have ſometimes met with the foramen Rivini; but the latter of them aſſigns it a different place from that given it by Rivinus.

Our author, whoſe care and accuracy are not to be queſtioned, is not aſhamed to confeſs, that tho' he had often ſought for this foramen, he never could certainly ſay that he had found it, either in the human ear, or in that of any quadruped, tho' he had ſearched after it in both with the utmoſt diligence and care. He kept among his preparations ſeveral of theſe membranes, taken intire from the human ear, and in their natural ſituation; but all theſe, he aſſures us, were perfectly intire; nor was there the leaſt appearance of an aperture in any of them, either in the place aſſigned to this foramen by Ravinus, or that by Cheſelden. He alſo adds, that he was well aſſured that Ruyſch, and ſome others of the moſt eminent anatomiſts of his time, had ſought for this foramen with no better ſucceſs than he had done, nor had at all a better opinion of its exiſtence.

Our author, as well as Mr. Cheſelden, had met with a man who could diſcharge, out at his ears, the ſmoak of tobacco taken in at his mouth; but the man was deaf, and had received that injury by blows given him when young: and it was very reaſonable to ſuppoſe, that both the deafneſs, and the power of diſcharging the tobacco-ſmoak this way, were owing to the membranes having been abſolutely broken by theſe violences. He ſays, that he never had met with, or fairly heard of a perſon who could do this, and who enjoyed his hearing in any degree of perfection; and that he had many among his pupils who ſmoaked much, and who had attempted to do this often, but without the leaſt appearance of ſucceeding in it. From all this it is to be concluded, that this foramen, if it be found ſometimes, as Rivinus and others deſcribe it, yet is not natural or univerſal, but that the generality of men and of quadrupeds have it not. The effects related in conſequence of there being ſuch a meatus or aperture, can indeed only be accounted for, by allowing that there is ſuch a one; ſo that our author recommends it to all future anatomiſts to ſearch carefully after it, and by their joint obſervations to convince the world whether, and whether more or leſs frequently, it be found in human and in quadruped ſubjects.

Rivinus's pupils, with ſeveral of whom our author had been acquainted, all joined in telling him, that Rivinus uſed to demonſtrate this foramen in his diſſections, by placing a briſtle on the part of the membrane where he ſays it is ſituated, and, in their preſence, letting it thro'; but that he did not pretend to be able always to expoſe it to the eye. Our author tells us, that he tried this method, and that he could make the briſtle paſs; but he always has had a ſuſpicion that the briſtle makes its own way by forcing a hole in this tender membrane, rather than finds a natural aperture to paſs thro' at. The experiment never ſucceeded with him, unleſs he thruſt the briſtle forward with ſome force; and he obſerves, that the ſame degree of force would make it pierce this tender and fine membrane in any other place as well as in this.

Waltherus, in his Diſſertation on the Membrana Tympani *, after a multitude of experiments made for this purpoſe, declares himſelf of our author's opinion, that there is naturally no ſuch aperture as this deſcribed by Rivinus, Cheſelden, and others. On the contrary, Teichmeyer not only aſſerts that this aperture is conſtant and univerſal in the membrane in the ears of all

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* Publiſhed at Leipſick in 1725, 4to.

creatures, but he gives a method of finding it with great eaſe and certainty in the ear of a calf. He has deſcribed his method at large, and has not omitted the aſſiſtance of figures to expreſs it *. Our author, after carefully peruſing him, declares that he never could be ſo happy, in repeating his experiments, as to paſs the ſtyle thro' this aperture with that eaſe and readineſs that he did, or aſſerts that he did: and he obſerves, ſomewhat unluckily for Teichmyer too, that the place he has aſſigned this aperture is not the ſame that Rivinus has deſcribed it in. The figure which he has given of it in his Anthropologia, agrees very well with Rivinus's, as the opening is repreſented in what is called the greater area of the tympanum; but in his ſeventh figure, given in the works juſt alluded to, it is placed in the ſmaller area of the tympanum. Now if there were ſuch an aperture always, or but frequently in this part in men, it is impoſſible to ſay why we do not meet with numerous inſtances of men, who can diſcharge the ſmoak of tobacco at their ears: or how it happens that the inſtances of people who can do this are ſo few, as the thing muſt be eaſy on this principle. There are many other obvious arguments againſt the exiſtence, or at leaſt the univerſal exiſtence, of this aperture in this membrane; but theſe are ſufficient.

NOTE 61.

In regard to the number of the oſſicula auditus, it may be proper to obſerve here, that Teichmyer, in his Anthropologia, enumerates ſix of them in each ear; and, beſide thoſe four uſually reckoned, deſcribes and figures two new ones, which he had diſcovered in the ear of a calf. The firſt of theſe, which he calls os lenticulare, he tells us is placed between the malleus and incus, in the manner of a ſeſamoide bone; and that it is joined to them both by ligaments, and ſerves to ſtrengthen the articulation, in the manner of a patella. The other, or ſixth bone of the ear, he tells us, adheres to the extremity of the tendon of the muſculus ſtapedis: and he adds, that this muſcle is not inſerted into the head of the ſtapes, as has been uſually ſuppoſed; but is inſerted into this bone, which is of an oval

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* Vindiciæ quorundam inventorum ſuorum, Lenæ 1727.

oval figure, and is connected laterally to the ſtapes. And, finally, he adds, that this bone had been obſerved before by Veſlingius; but that the other had never been diſcovered by any body.

That which adheres to the ſide of the ſtapes is very eaſily found in the ears of calves, and Cowper has figured it; and our author never omitted, in his courſes, to ſhew it to his auditors: but in this work he omitted the mention of it, becauſe, tho' ſo general in the calf, he had never met with it in an human ſubject. Schelhammer tells us, that he had found ſuch bones in the ears of quadrupeds; but he adds alſo, that he never had met with any of them in the human ear. As to the other bone, called by this author the fourth, we have already declared our opinion of it; for if the epiphyſes of the bones are to be enumerated as ſo many diſtinct bones, it will be eaſy to add to the number in other parts as well as this. The os femoris, at this rate, is not to be called one bone, but five.

The author who had added this, is not however content with what he did at firſt, but has of late added a ſeventh to the number of the oſſicula auditus, which, from its figure, he calls os triangulare. This alſo, he tells us, he met with in the ears of calves; and adds, that it ſtands on the paries of the ſinuoſity of the os maſtoidæus, on which the thicker and ſhorter leg of the incus is placed, as on a baſe. He adds, that this bone is very difficult to be found, and indeed ſcarce at all ſo, unleſs after the organs of hearing have been boiled. Finally, Dr. Douglaſs mentions yet another oſſiculum auditus †, which has been obſerved in the tendon of the muſcle of the malleus, called the internal one of Euſtachius: but himſelf ſuppoſes this not a natural and univerſally ſeparate part, but to be found by a breaking of another part, and therefore not to be univerſally found.

NOTE 62.

The work in which this very ſingular courſe of the auditory nerve is deſcribed, is not frequent in this part of the world; nor indeed any where, except in Italy:

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* See his Vindiciæ before quoted, p. 22.

† See his Myograph. p. 27.

Magnet has even omitted to mention it in his Theatrum Anatomicum. Our author has, therefore, been at the pains of tranſlating the paſſage, in which it is deſcribed at length, from the author; and of giving a copy of his figure in a vacant corner of one of the plates of this work. See Tab. 2. Fig. 21.

The title of the book is Letters of Deſnoves, profeſſor of anatomy and ſurgery at the academy at Bologna, and of Mr. Gulielmini, profeſſor of medicine and mathematicks at Padua, and of other eminent perſons, on the ſubject of certain new diſcoveries. In this work we have a deſcription of the auditory nerve, in the following manner, given by Maſtichelli, a phyſician at Rome.

The pair of auditory nerves coming from the medulla oblongata, enter the foramen of the os petroſum; and after the harder portion is ſeparated from the ſofter, this laſt paſſes thro' a ſmall foramen, which forms the central line of the cochlea, and thence goes out at a little aperture, which, from a ſtrait baſe, runs directly upwards. Afterwards, in the upper part, there are diſcovered not only thoſe little and ſcarce viſible foramina, which Valſalva has deſcribed, but beſide theſe another meatus, into which a briſtle may be introduced: thro' this there is a free paſſage to the ſofter portion of the nerve, which has now the form of a ſimple filament, and which is increaſed in its beginning as its centre, and is elongated in its progreſs, and bends itſelf about, ſo as to run thro' the cavities which form ſpirales in the cochlea. After it has deſcended by the end of the baſe, it paſſes thro' a ſmall foramen into the veſtibulum. In this place, this ſoft and nervous part is covered, as it were, with a kind of mucous humour; and hence it is carried gradually, by divers inflexions, to the very arcus of the labyrinth; when, aſſuming again the form of a ſoft and nervous filament, it enters again the narrow cavity of a very ſmall canal; and paſſing thro' its cavity, returns again thro' the proper orifice of the ſmall canal; and after it has paſſed thro' this cavity, comes out at the large orifice of the arch: hence it enters the proper orifice of the ſmall canal, and paſſes out again at the common orifice of this arch, thro' which it finally enters into the great canal, and thence again paſſes out at its proper orifice; and, finally, paſſes out of the os petroſum by one of thoſe foramina, which open tranſverſely into the veſtibulum; and returning into the inner cavity of the ſkull again, inſinuates itſelf into the ſubſtance of the brain, where, as it makes its way in, it becomes divided into a number of branches, and joins itſelf to ſeveral of the little branches, in the manner that the little ramifications of the veins and arteries do in other places in the dura mater, in the ſuperior ſurface of the brain, and about the pineal gland.

That the intricate circuit of this nerve may be the better underſtood, we are to refer to the figure, which exhibits it ſeparated from the bones, that it may be ſeen in what manner it is that it makes its way thro' theſe ſeveral paſſages.

This is the wonderful courſe of this nerve, which Maſtichelli, who relates it, tells us was diſcovered by Simoncellus, a ſurgeon and anatomiſt at Rome. What he would principally attempt to demonſtrate from it is, that the ſoft portion of the auditory nerve does not make its way thro' the cavities of the cochlea and labyrinth in form of a membrane, as has been the common opinion; nor in form of zones, as Valſalva would have it, but in the form of a ſoft and delicate nervous filament, which, after all this circuit, makes its way back to the brain again. He tells us alſo, that the diſcoverer Simoncellius intended, in a ſhort time, to publiſh this and a number of other curious obſervations in a treatiſe, with the advantage of a number of very accurate figures. Our author has taken, as himſelf profeſſes, a great deal of pains to render the deſcription of the courſe of this nerve intelligible, in his tranſlation from the original; nor have we been careleſs in the rendering it into Engliſh; yet we join with him in opinion, that it will appear obſcure to the generality, at leaſt, of readers. Our author pleads for himſelf, that it is ſo obſcure in the original, that ſcarce any body could be expected perfectly to underſtand the author's meaning. It was not proper to omit what has the appearance, at leaſt, of ſo very remarkable a diſcovery in anatomy; but we are to obſerve, that Camerarius, in his tenth diſſertation, has taken ſome pains to refute this ſyſtem of Simoncellius's; nor do we find that any body has been ſince able to follow the nerve thro' all the meanders, thro' which he has traced it in this deſcription.

NOTE 63.

In the firſt editions of this book the author mentions only three coats of the arteries, as it had been the cuſtom to allow no more; but he afterwards found, by more ſtrict examination, that the coats of the arteries are in reality five in number; and that, in the larger arteries, they are evident enough, and may eaſily be diſtinguiſhed in the order in which he has mentioned them here. In the outer membrane there are a great number of blood-veſſels. The ſecond is formed of reticular plexus's, and may be divided into lamellæ or flakes. The third is a membrane, firm, tough, and approaching to the nature of the tendons in its ſubſtance: when this is taken off, there appears a thick denſe coat, formed of a great number of evident muſcular fibres, which ſurround the artery in manner of circles or rings; and this tunic alſo is eaſily diviſible into ſeveral lamellæ. Finally, the fifth or inner tunic, which is placed within the fleſhy annular fibre, is called the nervous one.

In regard to the muſcular tunic, there have not been wanting authors who have denied that there properly was any ſuch. In a work publiſhed at Hall in Saxony, under the name of Bibliotheca Miſcellanea, in the German language, our author's Compendium being mentioned, the author denies the exiſtence of a muſcular coat of the arteries, partly on the authority of Pechlin and Schelhammer, and partly from obſervation that there were not what could properly be called muſcles there, and that the arteries ſometimes oſſified, which they declare to be quite contrary to the nature of any thing muſcular. The author adds alſo, that Schelhammer has aſſerted that the arteries were not conſtringed by any external force, or by means of any muſcular ſtructure; but that this change happened in them by mere ſubſidence.

But as it is evident, that in the inteſtines, and ſeveral other parts, fibres much ſmaller and finer than theſe do compoſe a muſcular tunic; and the motion and conſtriction of the inteſtines is univerſally agreed, by the anatomiſts of all times ſince its diſcovery, to be owing to this tunic, it is ſomewhat unreaſonable that it ſhould be denied that this coat of the arteries is muſcular, or that it ſerves for their conſtriction; ſince the fibres of it are much larger, and more conſpicuous, and, in their annular or circular courſe round the veſſels, form a multitude of evidently fleſhy pale red lamellæ, which are ſo obvious and diſtinct, that there is no miſſing them on diſſection: and as to the uſe of them, the conſtriction and motion in propelling the blood is vaſtly greater than in the other caſes in which they are allowed. The requiſites of a muſcle are a manifeſt fibrous ſubſtance, and a power of conſtriction and motion: theſe are properties of this coat of the arteries; and it is hard, that with theſe, and every other character of what diſtinguiſhes muſcles in other parts of the body, they ſhould be denied to be muſcles here.

As to the objection raiſed againſt the opinion of this coat being truly muſcular, from the arteries ſometimes oſſifying, we are to anſwer, that the aſſertion that muſcles are not capable of oſſification, is not true. The oſſa ſeſamoidea, which are found here and there in the extremities of ſeveral of the muſcles, are a proof that it is poſſible; and the dura mater, which, by the common conſent of anatomiſts, is muſcular; nay, and the inteſtines themſelves, in the ſubſtance of which there are ſometimes found oſſifications, abundantly evince, that an oſſification, where there is true and proper muſcular matter, is not impoſſible, tho' uncommon.

As to the authority of Pechlin and Schelhammer, we may oppoſe to it that of Morgagni: many others might be brought in on the occaſion, but this name alone is ſufficient. This author, in his Adverſ. 2. Animadv. 38. not only declares that the arteries have a muſcular coat or tunic, but enters ſo far into the diſquiſition as to eſtabliſh the doctrine of the fibres of it being annular, againſt Magnet's opinion of their being ſpiral.

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A multitude of other authorities might be produced to ſupport this ſyſtem; but the greateſt ſupport it can have is obſervation, and an examination of the parts themſelves. Whoever will enquire into the merits of the diſpute in this way, will allow, that the arteries have certainly a muſcular coat.

NOTE 64.

The greater number of the anatomical and phyſiological writers divide the great artery, into what they call its aſcendent and deſcendent trunk, in the ſame manner as the vena cavá is divided. But this artery, in human ſubjects, runs in a manner that might have given origin to a better diviſion *; for after it has ariſen with a ſingle trunk about three fingers breadth, it becomes inflected or bent in the manner of an arch, and takes its courſe thro' the thorax into the abdomen. This arch, as it deſcends from the baſis of the heart, according to the obſervations of Morgagni †, is about ſeven fingers breadth long; and is called, from the place of its inflexion toward the lower parts of the body, the truncus aortæ deſcendens, or the deſcendent trunk of the aorta; and from this part of it are derived all the arteries of the lower parts of the body.

From the upper part of the arch there are uſually, in human ſubjects, three remarkable branches running upwards: of theſe the right branch, ſometimes nearer the trunk, ſometimes more remote from it, becomes divided into two parts, which are called the right ſubclavian and the right carotid arteries. The middle branch is the left carotid, and the other or left branch is the left ſubclavian: there are afterwards diſtributed throughout the head and the arms.

Our author obſerves, that he has ſometimes, tho' rarely, found in female ſubjects four aſcendent branches. Of theſe the two outer ones have furniſhed the two ſubclavians, and the two middle ones the two carotids ‡. A heart of this kind, with the arteries injected, the author always kept in his muſæum, among his nume-

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* See an excellent figure of it in Drake's Anthropolog. T. 20.

† See Michelotti de Separat. Fluid. p. 104.

‡ Berger has figured and deſcribed four branches, Act. Erudit. 1689; but they differ from thoſe of our author.

rous preparations. It is but very rarely, if ever, that in human ſubjects there are only two aſcendent branches; much leſs are we to expect ever to find but one: whence it is very evident, that the aorta ought by no means to be divided, as it uſually is, into the aſcendent and deſcendent trunk; terms that may eaſily give very wrong ideas of this veſſel to thoſe who have only read anatomy, without ſeeing diſſections. Comparative anatomy ſeems to have given origin to this error. When human ſubjects were leſs frequently diſſected than at preſent, and moſt of the figures and deſcriptions of the parts were taken from thoſe of quadrupeds, it is not ſo wonderful that the terms of aſcendent and deſcendent trunk of the aorta were introduced; ſince, in quadrupeds in general, there is uſually only one large aſcendent branch, dividing afterwards into the veſſels of the head, fore-legs, &c. But in moſt quadrupeds this aſcendent branch, tho' it appears ſingle, is not truly ſo; but there uſually is another ſmaller one very near it.

The new delineations of theſe veſſels by Cant *, do not at all agree with the uſual and ordinary ſtate of them. He gives, as it were, only two aſcendent branches: the one larger than ordinary; from which afterwards proceed the right ſubclavian, and the two carotids; and the other at a great diſtance from it, from which riſes the left ſubclavian. Our author aſſerts, that among the great numbers of bodies he had publickly and privately diſſected, and examined with due care, as to the formation of theſe parts, he never met with one in which the veſſels anſwered to this deſcription, or to the figures given by this author. The branch which forms the left carotid, uſually begins from a very diſtinct part from the other two, nearly in the middle, between them; ſo that it is but juſtice to allow the figures of Ruyſch, Verheyen, and Drake, to be more accurate than theſe new ones. Drake, indeed, has figured the diviſion of the ſubclavian and right carotid ſomewhat too near the trunk; but otherwiſe his figures are excellent. Nicolai ſays, that he has given four branches; but this is not juſt: he has really given only three; for it is evident, both from Drake's

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* See Impet. Anatom. T. 4.

figure and explication, that he makes the right carotid ariſe from the ſubclavian.

NOTE 65.

The author juſt mentioned, Cant, in his firſt plate and ſecond figure, has given new draughts of the diviſions of the carotids; and, in his explanation of it, he falls foul upon all the writers who had gone before him, as to this matter. He declares all their accounts of theſe diviſions of theſe veſſels to be imperfect, and gives his new ſyſtem, which he ſeems to have ſuppoſed perfect, in their place: but perſons, who have been accuſtomed to examine theſe veſſels, after injection with a coloured waxy matter, will very eaſily diſcover that this gentleman's plan of them is not quite perfect neither. He has given them terminations which they have not; and every one, who has but ſeen the experiment of injecting them, muſt recollect that their branches run much farther in the face, and about the temples, than theſe imaginary terminations allow. The temporal ramifications in particular, inſtead of terminating where he would make them, run all over the upper part of the head in various ramifications, which form a kind of reticular plexus, and are connected on each part by anaſtomoſes with the arteries of the other ſide. In the ſame manner the artery which runs up to the cheek, and is figured by this author as if terminating about its middle in ſmall ramifications, does in reality not terminate there, or in that manner; but its principal branch runs over the cheek obliquely toward the larger canthus of the eye: it partly enters the orbit, where it divides into a multitude of ramifications, and partly runs up to the forehead in numerous others.

Another conſiderably large branch of this artery alſo, after a ſub-diviſion near the lips, runs into each of them, and has many anaſtomoſes alſo with the artery of the other ſide; and theſe are the veſſels which bleed ſo largely under the operation for the hare-lip, or other occaſions, in which it is neceſſary to make an inciſion there. It is to be remarked, that this author, with all his pompous pretences to perfection and accuracy, has allowed no arteries to the lips at all, in his figure.

It would be eaſy to point out, to the judicious obſerver, a great many other defects of this kind in his figure, particularly in regard to the variations of the firſt diviſion of the carotids; but it is not neceſſary: the obſerver will find them, on compariſon, very obviouſly. The author, indeed, ſeems to have been but very little a maſter of the art of filling the veſſels by ſolid injections: if he had, he would have been able to have thrown his injection much farther, and filled the veſſels of the face much more perfectly; and if he had examined the carotids in a variety of ſubjects, he would not ſo poſitively have aſſerted that their flexions and ſituation were always exactly as he has given them, perhaps from only a ſingle ſubject. We find them, on diſſection, ſometimes indeed nearly as this author has figured them; ſometimes alſo nearly as Drake has given them, and ſometimes their flexions are quite different from what are laid down by either. All this will appear, very familiarly and obviouſly, to any one who will take the pains to inject them often, with good matter and good ſyringes.

NOTE 66.

The anatomical writers, almoſt without one exception, tell us, that the vertebral arteries, ariſing from the ſubclavians, aſcend up to the cranium, thro' the foramina formed by nature for that purpoſe, in the apophyſes of the vertebræ of the neck; and by this ſeem to lay it down as a fact, that theſe arteries paſs thro' theſe foramina in all the vertebræ of the neck. Our author obſerves, that in a number of obſervations which he had made on them, in different ſubjects, by injection, he has conſtantly found that theſe arteries do not enter theſe foramina in the ſeventh or loweſt vertebra, but in the loweſt except one, that is, the ſixth. This is an obſervation not made by any body before him; tho' it might have been made out by the obſerving that the vertebral veins, in reality, paſs thro' the foramina of the ſeventh and loweſt vertebra. The intent of nature in not ſuffering the arteries which paſs thro' theſe narrow paſſages in the others, to go thro' thoſe in particular where the veins muſt paſs, ſeems to be to prevent the arteries, in their dilatation, from compreſſing thoſe veins, and thus preventing the free paſſage of the blood. It ſeems to be for the ſame reaſon alſo, that in the cranium the veins and arteries do not paſs thro' the ſame, but thro' different foramina.

NOTE 67.

Our author has obſerved before, that the arteries of the œſophagus have been deſcribed but by few writers. Nicolai * quotes only Drake and Ruyſch, on the occaſion of them; and the latter of theſe only knew of a few paſſing to the gula from the aorta: but in many diſſections he has obſerved, he tells us, two or three ſuch arteries, ariſing by diſtinct beginnings from the aorta. He uſed to ſhew theſe to his pupils, and has been ſo lucky as to ſucceed to admiration in his injections of them, with a waxy matter coloured.

NOTE 68.

Nicolai, mentioned in the laſt and ſome of our preceding notes, ſuſtains it, with Willis and Fallopius, againſt Veſalius, Ridley, and our author, that the vertebral veins do not go up into the cranium, nor reach the lateral ſinus's †. It is to be allowed, that this is always the caſe in thoſe peculiar ſubjects, in which thoſe foramina or canals behind the condyloide apophyſes of the os occipitis are obliterated or cloſed, as is frequently the caſe: but as in many bodies we find theſe foramina open, and manifeſtly terminating in the lateral ſinus's, in theſe nature is to be ſuppoſed to perform her more regular courſe, and theſe are therefore to be looked on as the ſtandards of truth. In theſe, if the other ſinus's of the dura mater be injected with a waxy matter, thro' the longitudinal one, and the veins ariſing from them filled at the ſame time, it will be very obvious, that the vertebral veins enter the cranium by theſe foramina, and inſert themſelves into the lateral ſinus's, near their exit out of the cranium. Our author often found it very fairly made out by this method of injection, and makes no doubt but whoever ſhall find a ſubject ſo formed, and go to work upon it in that manner, will ſucceed in the diſcovery. It may not be improper alſo to aſk of thoſe authors, who deny the communication

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* See his Diſſertat. de Direct. Vaſor. p. 64.

† See the ſame work, p. 4.

of the vertebral veins with the lateral ſinus's, by means of theſe foramina in the cranium, to what purpoſe they ſuppoſe theſe foramina to have been formed?

NOTE 69.

Mr. Cheſelden, in the firſt edition of his Anatomy, publiſhed in the year 1713, firſt mentioned the remarkable valve in the inferior trunk of the vena cava, near the heart, called the valvula Euſtachii; and in his ninth plate in that edition gave a figure of it, tho' not ſo perfect a one as might have been wiſhed: he aſcribes the diſcovery of it to Dr. Douglaſs, and calls it the valvula nobilis cavæ aſcendentis, by which name he means the inferior trunk of the cava; but in the third edition of his book, he has left out the plate in which this figure ſtands. It is probable, that the ſixth figure in the eighth plate of Euſtachius, in his Opuſcula Anatomica, firſt publiſhed at Venice in 1564, and afterwards at Leyden, under the care of Boerhaave, in 1707, gave Douglaſs the hint for this. But Euſtachius does not call it a valve, but a membrane of a wonderful ſtructure, which is placed before the foramen of the vena cava, aſcending from the liver, as ſoon as it degenerates into the right auricle; occupying its anterior half, and then forming a kind of reticulation *. Such are the expreſs words of Euſtachius; and, as to its uſe, he does not ſo much as give his opinion †. But Lanciſi, in the late publiſhed plates of Euſtachius, which were ſuppoſed to have been loſt, particularly in his explication of the third figure of the ſixteenth plate, calls this a valve; and tells us, that he is of opinion that it prevents the blood, deſcending from the jugulars thro' the upper trunk of the cava, from meeting with too much violence, with the blood aſcending by the lower trunk of that vein. But Winſlow is the author who has beſt of all deſcribed this valve, and explained its nature: he calls it the reticulated valve of Euſtachius ‡.

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* In his book on the Vena ſine pari, he has given a fuller deſcription of this valve.

† Bauhine, in his Appendix to the Theatrum Anatomicum, T. 8. fig. 1. gives the ſame figure from Euſtachius; but he ſays nothing of the uſe of the membrane, nor indeed does he call it a valve.

‡ See Memoirs of the Paris Academy, 1717.

He has given an elegant figure of it, lunated and reticulated; and has deſcribed its ſituation and connections much more accurately than any body who had gone before him. He obſerves, that its hollow part is turned upward, and its convex part downward; and has obſerved, that, in looking for it, in diſſections, the poſterior part of the cava, not the anterior, is to be opened, otherwiſe that it will hardly be found. He obſerves alſo, that in adults, in whom the foramen ovale of the heart is cloſed, this valve is often wholly wanting; but that in new-born infants, or in any ſubject in which the foramen ovale is open, it may be eaſily found, eſpecially on firſt plunging the vein under water for ſome time. After many other judicious remarks he adds, that, beſide the uſe which Lanciſi aſcribes to it, it is evidently of great ſervice in thoſe young ſubjects in which it is moſt obvious and remarkable, in preventing the blood from making its way from the right auricle, or from the upper trunk of the cava, into the lower. Winſlow's whole diſſertation on this ſubject is worthy the author, and eſpecially worthy a careful reading: he ſpeaks very judiciouſly in it of the nature and uſe of the foramen ovale; and maintains, againſt the common opinion, with Meyer, that the membrane placed oppoſite to it is not a valve.

NOTE 70.

Anatomiſts agree, that the nerves ariſe from the medulla oblongata of the brain, or from the ſpinal marrow; but they do not at all agree about what particular parts of the medulla they ariſe from. Whoever examines Willis and Vieuſſens on the ſubject of the nerves, Du Verney on the organ of hearing, T. II. Ridley on the brain, and after theſe Morgagni and Santorini in various places, will ſee this. Others alſo, who have abſolutely written from their own obſervation, differ as greatly from theſe, as they from one another.

It is eaſy to ſee where an author's candour and accuracy are to be depended upon, and where not. We find theſe differences in the deſcription of the places of the origin of the nerves in authors, all of whom are to be ſo depended upon; and we are to determine, in conſequence, that it is not only one of them, but perhaps every one that is in the right; and that nature herſelf varies, in this particular, as much as their deſcriptions do. Morgagni has obſerved, that in the origin, and even in the diſtribution and plexus's of the nerves, the anatomiſt will find great differences, in regard to the ſame pair, in different ſubjects; and he argues very juſtly from it, that nature does not tie herſelf down to thoſe ſtrict laws, in this particular, that ſhe does in many other caſes, but is very uncertain and various *. Santorini alſo, who had beſtowed more time and pains than any man ever did, or probably ever will, in tracing the nerves from their origin; yet confeſſes, after all his attempts, that it is impoſſible to arrive at any degree of certainty in laying down the places of them; for that the origin of the nerves of the brain are not conſtant, but vary greatly †.

To deſcend more to particulars, there is ſcarce any thing about which the accurate anatomiſts of late have ſo much differed as about the true origin of the intercoſtal nerve. Moſt of the late writers agree with Willis, that it ariſes from both the fifth and ſixth pair; and ſome aſcribe ſome certain branches, others different ones to it. Euſtachius, as appears evidently from his tables, deduces it wholly from the ſixth pair; and Morgagni in general agrees with him: he ſays, that he has often found it taking its origin from one, ſometimes from two, ſometimes from three branches of the ſixth; but that he never was able to find it fairly and clearly ariſing in any part from the fifth ‡.

Lanciſi differs from all theſe: he will not have it deduced either from the fifth or ſixth pair; but gives it a peculiar and diſtinct origin from the protuberances of the brain, where they are connected with the peduncles of the glandulæ pinealis §. Cowper will affirm nothing as to the certain and conſtant origin of this nerve, but leaves it variable and uncertain ||. And, finally, Santorini

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* Adverſar. Anat. 2. p. 75 and 76. and Adverſ. 6. in various places.

† Obſervat. Anatom. p. 63 to 67.

‡ Adverſ. Anat. 6. p. 30.

§ Morgagni, Adverſ. 5. p. 105.

|| As Morgagni obſerves, p. 30. Adverſ. 6.

rini agrees with Vieuſſens and Ridley, and gives its origin conjunctly from the fifth and ſixth pairs, declaring that he has ſeen it ſo *. Our author, whoſe accuracy is by no means to be queſtioned, reconciles all this variety of opinions, by obſerving, that, in different ſubjects, he has ſeen it ſometimes riſing conjunctly from the fifth and ſixth pair, ſometimes from the ſixth pair only. From this our firſt aſſertion is very evidently proved, that nature is herſelf various and uncertain in this matter; and nothing is more certain, than that not only theſe but other of the nerves vary extremely in the places of their origin. And we are to add to this, that accurate obſervations are very difficultly made on this ſubject; for that the extreme ſmallneſs and ſoftneſs of the nerves, about their origin, renders them liable to ſo many injuries, on taking out the brain, and making other neceſſary preparations for their obſervation, that it is eaſy they ſhould be diſplaced, injured, or even deſtroyed in this part, in the very attempt to examine them.

NOTE 71.

All the medical and anatomical writers, almoſt without exception, have followed Willis in allowing ten pair of nerves to the brain; but our author is of opinion, that the tenth or laſt pair of theſe is very improperly added to the number of the nerves of the brain. It has not its origin from the brain, or the medulla oblongata, but from the ſpinal marrow; which reaſon alone, if there were no other, one would think, might determine in favour of his opinion, that this pair is not to be called a pair of nerves of the brain; but that they ought to be referred for the future to the nerves of the ſpinal marrow, of which they are the genuine and proper offspring: but this is not all that pleads againſt it. We are to obſerve, that this pair of nerves does not paſs thro' any foramen in the cranium, as all the pairs of nerves of the brain do; nor, indeed, does it come ſo near this as to paſs between the cranium and firſt vertebra of the neck, tho' Willis has affirmed this, and people have followed him in it: but, in reality, it paſſes between the firſt and ſecond vertebræ of the neck.

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‡ See Adverſ. Anat. 6. p. 39 and 40.

This is an obſervation which our author has the honour of being the firſt perſon who made; but it has been confirmed by the moſt accurate anatomiſts ſince. This author very poſitively aſſerts, that he never, in any one diſſection, found any nerve paſſing between the cranium and the firſt vertebra of the neck: and it is plain, from the words of Willis himſelf, on whom all the reſt who affirm it depend, as their authority, that he was in doubt about it. He does not ſpeak with that air of certainty, on this ſubject, that is uſual with him on many occaſions; but leaves us room to ſuſpect, from his very manner of delivering it, that he rather conjectured than ever fairly or clearly ſaw what he deſcribes. According to our author's more certain obſervations, this pair of nerves are by no means to be ſaid to belong to the brain. They have their origin and egreſs both quite out of the limits of the cranium, and are evidently to be referred to the nerves of the ſpinal marrow, and are properly the firſt pair of thoſe. Morgagni readily agrees with our author's ſentiments, as to this pair of nerves not ariſing from the brain or medulla oblongata, nor paſſing thro' any foramen of the cranium*: but he obſerves, with Ridley, that they differ from all the other nerves of the ſpinal marrow, in that they do not, like them, ariſe from an anterior and poſterior origin; and therefore he is not for allowing them to be properly one pair of that ſeries, all of which beſide agree in a character in which they differ from theſe. But in anſwer to this, we are to obſerve, that Santorini agrees wholly with our author in opinion †; and has ſhewn, by an uncommon accuracy in reſearches to this purpoſe, that this pair, as well as the others of the ſpinal marrow, do actually take their origin both from the anterior and the poſterior ſurface of the ſpinal marrow. No one will call in queſtion the authority of ſo judicious and accurate a writer as Santorini, on this ſubject; and it follows, therefore, that as this pair of nerves have all the properties, and all the characters, of the nerves of the ſpinal marrow, and not of thoſe of the brain, they are, from the time of theſe diſcoveries, to be added to the number of the ſpinal nerves, of which they are the firſt pair; and that, agreeing with Willis's account in other reſpects, we are to allow only nine pair of nerves to the brain.

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* Obſerv. Anatom. p. 66.

NOTE 72.

While our author was employed in obſerving, under ſeveral ſubſequent diſſections, the uvula and its muſcles, he often obſerved, from the root of the ſmall apophyſis of the pterygoide proceſſes, which Santorini, not improperly, calls the horn of theſe proceſſes, a ſeries of fleſhy fibres, very conſpicuous in their origin there; which, afterwards joining, form a very minute muſcle, whoſe tendinous expanſion terminates in the velum palatinum, toward the upper part of the uvula, which part, by the aſſiſtance of other muſcles alſo, it draws upward. This little muſcle our author has given the name of cerato-ſtaphylinus to; and the reader will find a figure of it in our eighth plate, figure 38, Letters *l l*. That it is a muſcular part is evident, beyond a doubt; as alſo, that it ſerves in the office of a muſcle, with others. It is ſmall, indeed; but it is ſeparate from the others, and has as good a title to be allowed a diſtinct muſcle as many of the others of the ſame part.

NOTE 73.

Schelhammer accuſes the generality of writers on anatomical ſubjects, of his time, for allowing, with Drelincourt, forty-four intercoſtal muſcles. He adds, that the intercoſtal fibres are not ſo diſpoſed as that they can ſeparately form muſcles; but that they are mixed together, that they may decuſſate with one another in their courſe. He ſays, that one order of them runs obliquely from the inferior external part of the upper rib to the ſuperior and internal part of the lower; and another ſeries or order, on the contrary, runs from the inferior internal part of the upper rib to the ſuperior and external part of the inferior rib, and that in the ſame oblique direction. The reaſon of this fabrick, he ſays, is, that the ribs may be liable to be moved, not only upwards, but outwards; by which the cavity of the thorax might be the more enlarged: and, on this plan, he ſays, the thorax forms a kind of bellows, ſuch as never have been, or probably ever will be, made by any artificer.

In conſequence of this ſyſtem, Schelhammer allows the intercoſtal muſcles to be only twenty-two, or half the number received by authors; and to theſe twenty-two alone, with the aſſiſtance of the ſubclavians, he attributes the elevation of the thorax. Govey goes much farther in the reduction of the number of theſe muſcles than this author: he ſays, that all the intercoſtals together form only one muſcle, which is divided into ſeveral bellies *. He uſes a very ſingular experiment to prove this; which is, he takes one whole ſide of the thorax of a human ſubject, or of a quadruped, and boils it in water 'till the fleſh be ready to ſeparate from the bones: after this, on carefully ſeparating and extending the fleſhy matter, it is all found to be continuous, and not formed of a number of different parts. This is an experiment that will not fail to pleaſe thoſe who are not fond of multiplying the number of the muſcles.

NOTE 74.

It is not without ſufficient reaſon that Winſlow obſerves, that even the moſt careful of the anatomical writers had not, with a proper accuracy, given accounts of the interoſſeous muſcles: he gives a very natural reaſon for the neglect, by obſerving, that they are the laſt that are demonſtrated in the courſe of Myology; and the anatomiſt, by that time he comes to them, is tired and fatigued, and longs to get to an end of his buſineſs. It is hence, he obſerves, that theſe muſcles have ſeldom been ſo thoroughly examined as they ought, but are generally mentioned in a tranſitory manner. Even Cowper, he obſerves juſtly enough, tho' a very diligent enquirer into the nature of the other muſcles, has deſcribed theſe but very imperfectly. Winſlow, for this reaſon, determined to give a better and more accurate deſcription of them: he continues the old diviſion of them into the internal and the external; and he agrees, that their number is, as authors have laid it down, ſix; but he does not at all agree with the others as to their inſertions, or their uſes. Some of the writers before him, he obſerves, have determined all the exter-

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* See his Veritable Chirurgerie, p. 189.

‡ See Memoirs of the Paris Acad. 1702. p. 114.

nal ones to perfect the office of abductors, and all the internal ones of adductors; and that others of them have eſtabliſhed exactly the contrary. Winſlow agrees with neither; but eſtabliſhes it, that the two prior of the external ones, that is, the two which are neareſt to the index, are inſerted only into the middle finger, on each ſide; and that they ſerve as adductors and abductors to that finger only: the third, he ſays, belongs to the digitus annularis, and is an abductor; and by numerous obſervations he thus proves, that the external interoſſei, tho' appropriated by others to ſuch different purpoſes, do really belong only to two of the fingers, the middle and the annular.

The firſt of the internal ones, he ſhews, belongs to the index; the ſecond, to the annular; and the third, to the little finger, acting as an abducent muſcle to that finger: and thus he proves that the internal interoſſei have nothing to do with the middle finger, but belong to the other three. But, with all due deference to the character of ſo excellent a writer, we may obſerve, that it is not eaſy to conceive how the internal interoſſeus, which he ſays is an abducent to the little finger, if we conſider its ſituation, what anatomiſts mean by abducents of the fingers, are ſuch muſcles as ſeparate them farther from the thumb; but how a muſcle thus ſituated can perform this, is a thing not ſo eaſily underſtood as Mr. Winſlow would have it.

Dr. James Douglaſs, in his Myographia, deſcribes theſe ſix muſcles in much the ſame manner as Winſlow has done in this Memoir; but he is more prolix. It is but juſtice to this excellent anatomiſt to acknowledge, that no man appears to have underſtood the muſcles better; and to add, that his Myographia was publiſhed in 1707, Mr. Winſlow's Paper not till 1720.

Winſlow, who is a very candid writer, and has too much merit of his own to be in any neceſſity of borrowing praiſe at the expence of another, ſeems not to have met with this excellent work of Douglaſs's. This author agrees to the diviſion of theſe muſcles into internal and external: the external ones, he obſerves, fill the whole ſpace between the bones of the metacarpus, on the back of the hand; theſe he therefore allows are very properly called interoſſei: but the internal ones, he obſerves, have leſs title to that name, as they ariſe from the anterior part of the bones of the metacarpus, toward the palm of the hand, and are viſible only in the palm of the hand, not at all on the back of it; whereas the external ones appear on both ſides.

The firſt of the internal interoſſei, he ſays, ariſes partly tendinous, partly fleſhy, from the whole anterior part of the metacarpus bone of the index, between the head and the condyle; as alſo from the ſuperior part of the metacarpal bone of the middle finger, and is inſerted into that ſide of the fore finger which is next to the middle finger.

The ſecond of the interoſſei, which is the firſt of the external ones, ariſes from the greateſt part of the external ſide of the metacarpal bone, which ſupports the middle finger; and, in ſome degree, tendinous from its inner part, nearly under its head; and thence extends itſelf along the ſide of the middle finger which is neareſt the index *.

The third of the interoſſei, which is the ſecond of the external ones, according to the general diviſion, is extended along the other ſide of the middle finger, and fills all that ſpace which is between the metacarpal bones of this and of the annular finger, from which it has its origin.

The fourth interoſſeus, which is the ſecond of the internal ones, runs along that ſide of the annular finger which is next to the middle one: it ariſes from the whole anterior face of that bone of the metacarpus, to which the annular finger is affixed.

The fifth, which is the third of the external ones, runs along the other ſide of this finger, and fills up the whole interſtice between the metacarpal bones of the annular and little finger, from which it has its origin.

The ſixth of the interoſſei, which is the third of the internal ones, is extended along that ſide of the little finger which is next to the annular one; and has its

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* The author's method would have been leſs obſcure, if he had firſt deſcribed all the external, and afterwards all the internal ones; but we have no right to change it.

origin, partly tendinous, and partly fleſhy, from the whole anterior face of that metacarpal bone.

All theſe muſcles, both the internal and external, paſs under a certain tranſverſe cartilaginous ligament; and, after this, each forms two tendons; the one of which is preſently inſerted into the upper and lateral part of the firſt internodium; and the other expands itſelf ſo much as to cover the greater part of the firſt juncture, to which the tendon of the extenſor adheres: after this it becomes ſomewhat narrower again, as it approaches the ſecond internodium, where the laſt named muſcle is terminated; and runs obliquely along this bone, and there is terminated itſelf in the upper part of the laſt joint, after it has joined the fellow of it on the other ſide.

As to the uſe of theſe muſcles, Dr. Douglaſs gives it as his opinion, that when the long tendons act, the laſt joint of the finger is extended; and that they thus ſupply the place of an extenſor magnus, which is wanting in this part; but that, when the ſhort ones act, the fingers are moved ſideways: that is, they either are drawn towards the thumb, or are ſeparated farther from it. Such is the opinion of Douglaſs, as to the nature and uſe of theſe muſcles. Winſlow, who certainly had not met with his work, agrees in every material point with him; and our author, who took no common pains in following them in their obſervations, in a number of diſſections, agrees alſo perfectly with them in all the eſſential matters.

As perfectly eſtabliſhed, however, as the doctrine of theſe muſcles might ſeem from ſuch concurrent teſtimonies, Dr. Stockhuſius, a phyſician of Magdeburg, who had formerly been a pupil of our author's, and who had acquitted himſelf ſo well in his ſtudies as to leave no common reputation behind him when he left the ſchools; after all theſe diſcoveries and obſervations, undertook to examine theſe muſcles himſelf, in a more than ordinarily accurate manner; and, in conſequence of his obſervations, finiſhed drawings of them with his own hand; which, with a new deſcription of them, formed on the ſame ſubjects, he communicated firſt to his old maſter, and afterwards to the Academy of Berlin;

lin; and explained the whole by a human hand, prepared for the purpoſe, and exhibited with his paper before the Academy of Berlin.

This author ſets out with declaring, that the interoſſei, tho' generally ſaid to be only ſix, are in reality nine, ſix of which are internal ones: and he adds, that they are to be diſtinguiſhed, without difficulty, in all ſubjects, as he has figured them. Every one of the three interoſſei of authors, he ſays, is diſtinguiſhed into two, in a very evident manner, by a diviſion in its middle, by a quantity of fat, and a white line; and even has two ſeparate bellies, which may be very eaſily parted from one another; and, which ſets the matter beyond all diſpute, each of theſe bellies has its ſeparate and proper tendon, and each of theſe is inſerted in a peculiar part, nay, in a peculiar finger. This he alledges as the ſtrongeſt of all proofs of their being each really two diſtinct and perfect muſcles; and, in conſequence, that, inſtead of three, the uſual number allowed, the internal interoſſei are truly and properly ſix. The originations of theſe muſcles the author has not thought it neceſſary to enter into the deſcription of: his figure ſhews, that he agrees with Dr. Douglaſs in this, and his deſcriptions therefore need not to be added to or altered; but, in regard to their extremities, he differs extremely both from Douglaſs and all the other writers; and has very elegantly figured, and very punctually deſcribed them. The firſt of them, he ſays, which is neareſt the index or fore finger, applies its tendon to the internal ſide of that finger. The third is affixed by it to the external ſide of the middle finger, that is, to that ſide of it which is neareſt the index. The third is fixed to the internal ſide of the ſame middle finger; the fourth, to the external ſide of the annular finger; the fifth, to the internal ſide of the ſame finger; and, finally, the ſixth and laſt, to the internal ſide of the little finger. He is of opinion, that thoſe, the tendons of which are inſerted into the inſides of the fingers, ſerve to draw the fingers back from the thumb; and that thoſe, whoſe tendons are affixed to the external ſides of the fingers, ſerve to draw thoſe fingers toward the thumb; and conſequently that, as only the one, or only the others act, the fingers are drawn towards the thumb, or are ſeparated from it; but that, when they all act together, they ſerve to draw the fingers cloſe to one another; and that, additionally to all this, they are of uſe in the bending of the fingers.

This author agrees with the reſt of the world, indeed, that the external interoſſei are three in number; but he obſerves, that they are of a different ſtructure from what had uſually been ſuppoſed. He ſays, that they are all bicipitous, or double, at their origin; and that one of their heads ariſes from one bone of the metacarpus, the other from another; and that theſe two bones are always thoſe, between which the muſcle lies: from this part, on each ſide, he ſays, there run muſcular fibres, ariſing from the bones, which deſcend obliquely toward the fingers; and that they join, and form, as it were, a body like a feather, (whence he declares them to belong to the penniform muſcles) about the middle of the interſtice between the two bones, and afterwards form a ſingle tendon each; the firſt of which, that which lies between the metacarpal bones of the fore and middle finger, is inſerted into the internal ſide of the index *; that which lies between the bones of the middle and annular finger, to the internal ſide of the middle one; and that which lies between the middle and annular finger, to the internal ſide of the annular finger.

From this it appears, that, according to Stockhuſius's opinion, the little finger has no aſſiſtance from the external interoſſei; and that theſe interoſſei ſerve for the drawing away the three other fingers, *viz.* the fore finger, the middle, and the annular finger, from the thumb; and conſequently that all the external interoſſei are abductors. The author concludes with great modeſty, not deſiring this ſyſtem of his to be received as certain from his own obſervations, but ſubmitting it to the examination of other anatomiſts. We are apt to believe there is great truth and accuracy in his figures and deſcriptions; but we are to obſerve, with

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* In this particular the author differs both from Winſlow and Douglaſs, who both ſay that this tendon is inſerted into the exterior ſide of the middle finger.

Morgagni *, that there is ſo much variation in nature, in the conſtruction of the muſcles of the fingers, that it is impoſſible to give any certain and conſtant deſcription of them, which ſhall ſuit what is met with in every ſubject.

NOTE 75.

Littre, in the Memoirs of the Paris Academy for the year 1705, has given an account of a diſſection of a fœtus, in which the kidneys appeared to be of a veſiculous ſtructure: from this ſingle inſtance many have inferred, that the natural ſtate of the kidneys is veſiculous; but this is arguing much too haſtily.

We are to obſerve, in the firſt place, that theſe kidneys were, according to the author's own account, in a kind of monſtrous ſtate, very different from their natural one in a healthful and properly formed ſubject. This is evident from the ſtate of the ureters, which he deſcribes to us: theſe were, for near an inch from the kidneys, not only ſolid, or cloſed up, but the very ſides of the pelvis were found alſo concreted, or grown together: nothing can be more evident than that they were, therefore, in a diſtempered or unnatural ſtate; and therefore no general concluſion, as to the ſtructure of the parts, could properly be made from them.

We are to obſerve alſo, that tho' the author deduces, from this ſtructure of the kidneys of this particular fœtus, no leſs than eight concluſive arguments, as he eſteems them, for proving the ſubſtance of the kidneys, in general, to be glandulous; he has omitted one obſervation, and that the very capital one of all that might have fallen in his way; and which, however fairly the reſt are deducible from the caſe, very certainly and obviouſly is ſo; which is, that the human fœtus is not in abſolute neceſſity of having a ſecretion of urine, while in the uterus; and conſequently is not under a neceſſity of having the tunica allantoides, which quadrupeds have, and which many have ſuppoſed of abſolute neceſſity to the human fœtus alſo, tho' they have not been ſo lucky to find it.

This fœtus of Mr. Littre's was at its full period of nine months, and was killed in the birth; ſo that it is

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* See his Adverſ. Anat. 2. p. 40.

plain it had lived to that period without any ſecretion of urine; and, as the fœtus had lived ſo, it is evident that others may, as well as rational to ſuppoſe that all others do. The author expreſly tells us, that the ureters and pelvis were ſo perfectly coaleſced, that not a drop of the ſubtleſt fluid could be inſinuated between them; nor even air be forced in by inflation; much leſs was it poſſible, that ſo thick a fluid as the urine ever had made its way between them. It is evident, therefore, that no urine in this ſubject could have been conveyed from theſe ureters and kidneys to the bladder, to be thence ſent to the urachus and allantois.

Littre is ſo far from having fallen upon this important obſervation, however, that he concludes, from the veſicles of theſe kidneys being filled with a liquor reſembling urine, that therefore there is always a ſecretion of urine in the fœtus, during the time of its being retained in the womb; and conſequently that the fœtus muſt either diſcharge this urine by the common paſſages, or by the urachus into an allantois. It does not appear, however, that either of theſe propoſitions are fairly deducible from the facts. It is very neceſſary to be allowed, that there is ſome ſecretion performed in the kidneys of the fœtus; but it has never yet been proved, that the urine thus ſecreted is ſo conſiderable in quantity that it cannot be contained in the bladder, kidneys, and ureters, without a neceſſity of a diſcharge of any of it, till after the birth.

If we examine the condition of the kidneys in this fœtus of Littre's, it will appear, that all the liquor contained in the whole ſeries of the veſicles, was not ſo much as an ounce, tho' the fœtus was at its full period for excluſion. And it is evident, that no larger a quantity of this fluid could have been, during the whole time of geſtation, ſecreted in this fœtus; becauſe the ureters and kidneys were cloſed up, and no urine could have been ſent from them into the bladder for excluſion. As it appears very evident, that a human fœtus, in the ordinary courſe of nature, has the bladder conſiderably large, in proportion to its bulk; and may have, in that and in the ureters, and in the pelvis of the kidneys, a vaſtly larger quantity of fluid than that found in this fœtus's veſiculous kidneys, without any neceſſity of excluſion: and as this fœtus, otherwiſe well formed and healthy to all appearance, had only ſo ſmall a quantity as about an ounce of it ſecreted, it appears that there could have been no more neceſſity of emptying this little quantity into an allantois, than there was poſſibility of doing it; and hence, if the impoſſibility of thus diſcharging urine in this fœtus was attended with no ill conſequence to its health, it was not neceſſary to it; and if not neceſſary to it, it is not neceſſary in any.

Upon the whole, therefore, 'till the urachus in the human fœtus ſhall be found to be much more frequently pervious than it is, and 'till the allantois has been much plainer demonſtrated to exiſt than has been done at preſent, we are not rationally to ſuppoſe it a neceſſary or ordinary part.

If it be neceſſary to ſuppoſe that a much greater quantity of urine than can be conveniently contained in the bladder, kidneys, and ureters, muſt be ſecreted in the fœtus; it follows therefore, that there muſt have been alſo ſuch a quantity ſecreted in this of Mr. Littre's. It evidently appears, that but a ſmall quantity was found in this fœtus; and therefore, if there had been a larger, ſome of it muſt have been diſcharged. This diſcharge could not have been made in the ordinary way, as eſtabliſhed by authors, thro' the urethra, or the urachus, into the allantois, ſince the paſſages to theſe parts were wholly ſtopt up; and if it be allowed that there muſt have been other paſſages for the diſcharging it in this fœtus, it follows that there are ſuch other paſſages alſo in other fœtus's; and, conſequently, that an allantois, and the apparatus for the diſcharge of the urine into it, is not neceſſary in a human fœtus.

The quantity of urine voided by the fœtus's of many quadrupeds, during geſtation, particularly in cows, is vaſtly great. A woman, who ſtands only on two legs, could not walk with ſuch a load, without continually falling, tho' a quadruped may: nature ſeems, therefore, to have provided againſt it, by conveying out the urine of the fœtus, together with the blood, thro' the umbilical arteries, to the blood of the parent, to be voided with her urine in the ordinary way; and this ſeems evinced, not only by the foregoing reaſons, but by the very coalition of the ureters, &c. in this fœtus *.

Finally, we are to obſerve, that the peculiar ſtate of the kidneys in this fœtus did not appear, in all the particulars, ſo plain as the author's deſcription would lead us to believe. Fontenelle, the ſecretary of the Academy, tells us †, that tho' the kidneys, which he deſcribed, were indeed very tumid, yet he was not able to diſcover, without the aſſiſtance of a microſcope, the greater part of the ſingular circumſtances which he mentions of them. He quotes, however, in confirmation of this ſtructure in the fœtus's kidneys, an obſervation from Mayer, of the whole ſubſtance of the kidneys being found veſiculous in an adult.

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[*] See Molinett's Diſſert. Anatom. Patholog. lib. 6. c. 7. p. 304.

[†] See Hiſt. Acad. Reg. Scient. Anno 1705, p. 58. Ed. Amſtelod.

[‡] Colleg. Anat. 173.

NOTE 79.

AFTER the moſt perfect acquaintance with the bones, as preſerved and exhibited in the ſkeleton, there is ſtill ſomething wanting to a perfect knowledge of the oſteology of the human frame.

The bones, in order to their being arranged into a ſkeleton, in a firm manner, clean and dry, loſe many parts which they had, while in the body, eſpecially at their extremities; which parts it is of the utmoſt importance to us to know that they have, while in the body. Theſe are only to be ſeen by laying bare and examining the bones in a dead ſubject, while quite freſh; for, in the natural drying of them only, many would be loſt and obliterated in the boiling, in order to the forming into that artificial compages which we call a ſkeleton. Moſt of theſe parts are diſſolved, and leave no veſtige of themſelves on the parts of the bones where they were ſituated. In the dried ſkeleton, the utmoſt we can ſee of the bones is their figure, their ſituation in the body, and the parts at which they are connected to one another: but how, or by what means, that connection is performed in the body, we can only learn by examining them in their connected ſtate, while the body is yet in the condition (life alone excepted) in which it was while they were uſed. In this ſtate only it is, that we can perfectly underſtand the nature of their articulations: their connections at theſe parts, by means of cartilages and ligaments, ſhew us what is truly their ſtate in nature; and we find that, in the dried ſkeleton, theſe very articulations often wear a very different face from what they do in this ſtate, which is the only ſtate in which we have any real concern with them, or with accidents happening to them in the body.

Several of the cotyloide cavities, which are demonſtrated to us in the dried bones, are not hollowed in this manner in the natural ſtate in the body, but are glenoide: their cavities naturally are filled up with firm cartilages; but theſe are diſſolved and diſappear in boiling. Other of the cavities, on the contrary, appear much deeper in the natural ſtate of the bones than in the ſkeleton. Theſe are only glenoide in the dried bones; and their cavity, in the boney matter, has never been any deeper: but, while in their natural ſtate, they have been ſurrounded with cartilages, forming a kind of riſing rim about their edges, and making the cavity in the whole much greater.

The boiling neceſſary to the reducing the bones to the ſtate in which they are preſerved in the ſkeleton, diveſts them alſo of many other of their eſſential parts. Their perioſteum, for inſtance, the mucilaginous ſubſtance of the joints, and the marrow, all which have their ſeveral qualities and properties neceſſary to be known, in order to the making anatomy of its due uſe, and bringing it to the ſervice of the parts when diſtempered. The buſineſs of the ſurgeon, in reducing fractures, and luxations alſo, is eminently aſſiſted by this knowledge of the bones in the ſtate of nature, or in that in which only they become the ſubjects of his profeſſion. Every anatomiſt, in his courſes, ought therefore to demonſtrate, beſide the bones of the ſkeleton, thoſe of the recent body, cleaned from the muſcles and other parts that ſurround them. Riolan has the honour to be the firſt anatomiſt who ſaw the utility, not to ſay the neceſſity, of this double courſe of Oſteology. He always uſed it in his courſes; but the trouble and difficulty of obtaining bodies rendered it neglected after his time; nobody, after him, having been at the pains of doing it, 'till the accurate and indefatigable Winſlow. Riolan, who recounts the advantages of it, before remarked, always went carefully thro' it at the end of his courſe: Winſlow, ſtill more judicious, uſed to make the demonſtration of the recent bones the article that immediately followed his common oſteology, by the ſkeleton: by this means his pupils, immediately after they had obtained a general knowledge of the names, terms, and ſituations of the bones out of the body, were acquainted with their true ſtate and ſituation in it; and the remembrance of what they had heard before, was by this rooted in them, and ſerved as the baſis of the whole ſuperſtructure, the muſcles being afterwards vaſtly better underſtood in their ſituations.

NOTE 80.

What it is that determines the efforts of the fœtus, toward its delivery, from the priſon of the womb, which it had before ſo long patiently ſuffered, at the period of nine months, is a queſtion that has perplexed people in all ages. One of the firſt aſſertions, in regard to it, was, that the fœtus found a want of food: this, as wild and extravagant as it is, has no leſs a name than that of Hippocrates as its eſtabliſher and defender. It is not eaſy to ſee, however, how the fœtus ſhould either want nouriſhment at this particular period, or ſhould be actuated by ſuch a ſenſe, if it were true that it had it to attempt making its way out. The mother, we find, is very well able to afford nouriſhment to two fœtus's: how then are we to ſuppoſe ſhe can, juſt at this period, become wanting in regard to one? We find moſt women of robuſt habits, after delivery, having milk enough for the nouriſhment of two children: why then ſhould the ſame woman be ſuppoſed, juſt at the period of nine months, to want nouriſhment for one?

Others have advanced, that the fœtus ſeparates itſelf from the womb, at its due period, in the ſame manner that fruits do from the tree, when ripe: this might ſound prettily enough from a poet; but, from the mouth of an anatomiſt, it is not quite ſo creditable. Fruits, when ripe, are arrived at their perfection and utmoſt period of growth; but this is not the caſe in the fœtus. Beſide, to make out any analogy in the circumſtances, theſe authors ſhould find a parity of reaſon for the dropping off of both. The reaſon why fruits, when thoroughly ripe, fall from the tree, is, that their ſtalk, having now done its full office, dries up and withers, and conſequently no more juices are conveyed to the fruit thro' it: but, on the contrary, the placenta continues to be fully and perfectly ſupplied with blood and juices to the laſt; and is indeed affixed as firmly, and in a ſtate to perform all its offices as perfectly, at the very period of delivery as at any other time.

Others have ſaid, that the great increaſe of the liquor amnii makes the fœtus uneaſy, and is the occaſion of its moving about, and endeavouring to eſcape: but, before people build reaſonings on things, they ſhould be aſſured that they are facts. Now the truth is, that there is not any ſuch peculiar increaſe of theſe waters at this time; and that, if there were, there could be no reaſon for ſuppoſing that the fœtus would be incommoded in this manner by them. The fœtus, having not yet breathed would be no more diſturbed by an increaſe of theſe fluids, than a fiſh, by being put out of a ſmall quantity of water into a larger: and as to their quality, there is no change in that to occaſion any uneaſineſs in it; for, to the laſt, they are inſipid to the taſte.

The apparent inſufficiency of all theſe reaſons has put many people, ſince the time when they were advanced, upon finding a better. An author of very conſiderable fame, lays the whole force upon the urine and excrements: theſe, he ſays, increaſe by degrees, 'till, toward the time of the delivery, they form a quantity that is troubleſome to the fœtus, both in regard to its bulk and its weight: this makes it reſtleſs, and it begins to move about, its ſtrength at this time enabling it. In its motions its head naturally gets downward, and falls againſt the orifice of the uterus, with its face towards the coccygis: in this ſituation of the fœtus, its urine and excrements become more troubleſome to it than they were before. This occaſions more and more motions in it; and, in conſequence of theſe, it gets lower and lower. In this ſituation it brings on a teneſmus in the mother: the muſcles of the abdomen are put in motion by this, and the effect of their motion is the forcing the fœtus ſtill lower down: this increaſes the teneſmus in the mother, and conſequently the muſcles of the abdomen are ſtill more and more forcibly put in action. The conſequence of this additional preſſure upon the fœtus, and of it againſt the orifice of the womb, is, that it opens, and the membranes are preſſed upon 'till they break; the liquid contained in them is let out, and it ſerves to lubricate the parts, and diſpoſe them to diſtend and give way the more readily. In fine, the head of the fœtus preſents itſelf at the orifice of the uterus: the action of the mother's muſcles, and her efforts, preſs it downward into the vagina, which has not only been moiſtened by the liquors from the membranes of the fœtus, but its own lacunæ and ſebaceous glands continually, on this occaſion, diſcharge their lubricating contents; and it is by this means rendered capable of diſtention, and the fœtus comes forth! After it the navel-ſtring, the membranes, and the placenta follow, and the whole is ſucceeded by a greater or leſſer hæmorrhage.

Courvée, among the French, was the author of this ſyſtem; and Drelincourt and ſome others have been at great pains to ſupport it. Drelincourt, in particular, obſerves, that, at the period of nine months, the inteſtines are naturally full of the meconium; and that, in conſequence of this, the ſtomach begins to retain ſome of it, and would fill with it alſo, but that the firſt attempts toward this bring on a kind of cholicky or griping pains in the fœtus; and that theſe pains are what diſturb it, and give riſe to the motions that are the means of its being diſcharged out of the uterus.

Pechlin and Bohn declared themſelves diſſatisfied, however, with this account. They have attempted to prove, that it is not in conſequence of the fœtus's feeling pain that it is thrown into efforts, the conſequence of which is delivery; but that it is an attempt to reſpire that directs its head, at length, toward the orifice of the uterus. But it remains upon the favourers of this opinion to prove, that the fœtus is in this trouble and diſtreſs about breathing; which is not ſo eaſy to conceive, when we conſider that it has no occaſion for it.

Berger advances yet another opinion, which is, that the poſture the fœtus is placed in, during the whole time of geſtation, is a very uneaſy one; that, as it grows larger and more vigorous, it is more ſenſible of this; and that, in fine, when ſtrong enough to move freely, it makes efforts to put itſelf out of ſo confined a ſituation; and that, at length, it ſucceeds in theſe; the conſequence of this is its getting into that poſture, by means of which it aſſiſts itſelf in the excluſion.

The fœtus, while acquiring its growth in the uterus, is placed in ſuch a ſituation as to take up the leaſt poſſible room. It is contracted into a cloſe form: its head is placed upwards, and its back againſt the lumbar vertebræ of the mother: its knees touch its face, and the hands are placed upon them, with the noſe between them. This curled ſtate tho' it ſuffers, while very ſmall, yet, as it grows larger and ſtronger, it tries to alter it; and, in its attempts of this kind, its head gets downward, and preſents itſelf at the orifice of the womb for delivery. This has a face of reaſon: but if the author were to be aſked, why it is that the fœtus grows ſo particularly uneaſy at its curled ſituation, juſt at the end of nine months, and ſucceeds juſt at that time ſo happily in the freeing itſelf from it, he would find it very difficult to give any ſolid anſwer to it.

Another ſyſtem, which gained great ground at one time in France, was, that the menſtrual diſcharges, and the changes in the courſe of nature, in regard to them in pregnancy, did the whole. The menſes, he ſays, flow monthly at their period, merely from plenitude: as ſoon as a woman is with child, theſe ceaſe; becauſe the matter of this plenitude is taken off in affording nouriſhment to the fœtus. There is, however, ſtill a little of the blood, that would otherwiſe have been thus diſcharged, directed toward thoſe veſſels at which it uſed to be diſcharged: this becomes accumulated there, and diſtends them, tho' it is not able to force its way out.

The roots of the placenta ſtop up the orifices at which it ſhould be diſcharged, and its ſmall quantity is not able to overcome the reſiſtance: this quantity is, however, always increaſing; and by degrees it becomes ſo conſiderable, that, at the period of nine months, there is enough of it to force its way out by the veſſels of the uterus; but this can only be done by diſlodging the roots of the placenta. The efforts toward this, he ſays, give many motions to the uterus, and theſe are communicated to the fœtus: it begins to move itſelf forcibly, and, in conſequence of it, changes ſituation, and its head falls againſt the orifice of the uterus: the conſequence of this ſituation of the head of the fœtus is a teneſmus in the mother; and the conſequence of that is a motion of the abdominal muſcles, greatly aſſiſting the excluſion of the fœtus, as already obſerved. At the ſame time alſo the mother feels pains in her loins, about the rectum, and about the bladder, occaſioned by the compreſſion of the parts by the uterus; and the ſtools and urine are not evacuated but with difficulty. The motions of the fœtus, which are at this period very ſtrong, ſerve to burſt the membranes it is incloſed in, and the waters are then diſcharged out of them: the orifice of the womb opens; a glutinous humor, which had cloſed it, is the firſt thing diſcharged; and after this the liquors of the membranes, and the parts are lubricated by this; and the uterus, being at the ſame time irritated by it, preſſes forward its contents. The motions of the fœtus, which finds itſelf much leſs at eaſe after the diſcharge of the waters than before, occaſion motions in the uterus alſo, and theſe more and more enlarge the orifice of the uterus; and the head of the fœtus preſſing all this time againſt it, by degrees it opens to a due degree for the giving paſſage, on a ſtrong preſſure, to the head of the infant. This preſſure is given by the diaphragm and muſcles of the abdomen of the mother, and by the contracting power of the uterus itſelf; and, in conſequence, the fœtus aſſiſting by its own motions, it is excluded.

There is an appearance of great ſagacity and ſubtility in this; but, when examined ſeriouſly, it will be found to want weight. The accumulation of the menſtrual blood is not to be allowed in the ſenſe this author mentions it in; and, as this is the baſis of the whole, the ſuperſtructure muſt needs fall with it.

Such have been the various judgments of philoſophical and anatomical genius's, as to the occaſion of our firſt being thrown into this breathing world. They have been puzzled to find the cauſe that, at the end of nine months, delivers us out of the priſon nature had incloſed us in at our firſt exiſtence; but it ſhould firſt have been proved, that this exact period of nine months is the time allotted for it. This has been eſtabliſhed by every body as a principle to reaſon from; but this is not true, in fact. It is often impoſſible to determine, with any degree of certainty, the real time of impregnation; and inſtances, in ſufficient number, prove to us, that this is ſo far from being the punctual and exact period, that delivery happens at all the intermediate times between ſeven months and eleven. It is evident, from a great number of inſtances, that women do fall in labour at different periods between theſe; and at the end of the tenth month, in particular, ſeems to be a critical period, as well as the end of the ninth, tho' not ſo frequently.

We are therefore, in the eye of reaſon, to ſee many cauſes operating at once toward this important end; not one principal only, as theſe ſeveral authors have ſet out with ſuppoſing, the reſt ſeeming to them but as collateral and accidental aſſiſtances to it. The growth or increaſe of bulk in the infant, the fœcal matter, or meconium contained in the inteſtines, the ſize of the body, grown over-proportioned to the cavity it is lodged in, and the more than uſually violent and continued motions; all theſe may conſpire toward the great end, the excluſion; all may tend to determine the uterus to open its orifice: and to all theſe we are to add, the effect of the new muſcle of Ruyſch, and of the other muſcular fibres of the uterus, or perhaps of the whole uterus itſelf, conſidered as a ſingle muſcle; and we ſhall have a great number of co-efficient cauſes, all powerful, all directed to the ſame end.

The muſcular fibres are ſtretched and forced out of their natural ſituation by the dilatation of the fundus of the uterus; for it is the fundus that almoſt alone dilates above the ligaments: when this dilatation of the uterus is puſhed to a certain point, we may conſider the muſcles and muſcular fibres as now at a period, beyond which they cannot be dilated, and as hurt by it in ſuch a manner, that they naturally are to contract. The period of the contracting of theſe muſcles is, that when they can bear no farther dilatation, and when that which they have borne has become painful and irritating to them: but this is a time not ſo exactly regulated as ſhould ſeem from what theſe authors have advanced; but it varies in regard to the ſtate of the fibres themſelves, which differ in different ſubjects; and in regard to the bulk of the child, which alſo is different in different women, and in the ſame at different geſtations. Thus, in ſome, theſe muſcles are dilated to their utmoſt pitch in the eighth month; and in ſome, this does not happen 'till the tenth: whenever it does happen, labour comes on, and the fœtus is protruded. The intermediate period between the two extremes is that of nine months: it is not wonderful, therefore, that this is the moſt uſual time. On this then depends delivery, and this is the true ſyſtem of it, and occaſion that brings it on. The Creator has made the muſcular fibres of the uterus of ſuch a kind, that they can bear diſtention up to a certain point, but no farther: when they are thus far diſtended, they will have a re-action; and the conſequence will be an expulſive power, tending to diſcharge the thing that diſtends them. In this ſyſtem there is no occaſion for ſuppoſing ſuch great effects to be produced by the infants changing its poſture: nothing is more certain than that, during the time of geſtation, it is changing its poſture continually at times, without any ſymptoms of labour being brought on by it; and, even in the time of labour, it is not always found in this particular ſituation, with its head at the orifice of the uterus: but labours are too common, in which its being in other very different poſtures is of great difficulty to the hand employed, and pain and danger to the patient.

Harvey is of opinion, that the membranes ought not to burſt in a kindly labour; nor does he allow any to be natural, unleſs the membranes come forth whole and intire with the fœtus, and with their liquors in them. When the membranes have been broken, and their contents diſcharged, it appears to him that things have gone contrary to the intent of nature; but we are to obſerve, that, if this be the caſe, there are but very few deliveries that are in this courſe of nature; the burſting of the membranes, and the diſcharge of the fluids contained in them, almoſt always preceding the birth of the child. On the contrary, nature ſeems never to have meant any other than what we uſually ſee; and we are to admire her contrivance, in that ſhe makes the ſame thing ſerve at different periods to different purpoſes.

poſes. The liquor amnii, which at one time ſerved for the nutrition of the fœtus, when that intent is over, and the fœtus is to be excluded, ſerves to relax and lubricate the parts which are to be ſo wonderfully diſtended, in order to give way for its birth.

NOTE 81.

This aſſertion is not ſingular in our author: he is ſupported in it by ſeveral of the moſt eminent anatomiſts, both before his writing, and by the opinions of others at this time; yet it ſeems ſtill very queſtionable, whether it really is the caſe. Paree is the firſt author we meet with affirming it; but he ſpeaks it rather of his opinion than his knowledge. The great thing urged in favour of it by others is, that there is in ſome women ſo large a cavity in the place, that a finger will ſink into it; but this may be a mere depreſſion of that part of the bone, not a ſeparation. That it is poſſible ſuch an accident as an actual ſeparation may happen, we do not deny; but that it very rarely does happen, ſeems alſo certain.

EXPLANATION
OF THE
FIGURES.

IT has been judged proper to add to this Compendium of Anatomy ſome figures, exhibiting a number of new diſcoveries in this branch of knowledge.

Two of them only are borrowed from the works of other writers on theſe ſubjects, as has been obſerved in their proper places: the reſt are from obſervations made in publick diſſections, and had not appeared in any other work at the time of their being firſt publiſhed in this; tho' they have ſince been confirmed by the obſervations of many of the greateſt anatomiſts of the preſent age.

Explanation of the Figures in the Firſt Plate.

Fig. I. The malleus, one of the oſſicula auditus, drawn, for the ſake of perſpicuity, a little larger than it is in nature. It is from a human ſubject, and ſhews the apophyſis or proceſs, commonly called the proceſſus Ravianus.

a, The head of the malleus.
b, The manubrium.
c, The ſmaller apophyſis.
d, The long apophyſis, or proceſſus Ravianus.

The figure annexed is of the ſame malleus, drawn from a microſcopick view of it, for the ſake of exhibiting its parts the more diſtinctly. In this figure the capitals *A*, *B*, *C*, *D*, indicate the ſame parts as the ſmaller letters of the ſame denomination in the other figure.

It may not be improper to remark in this place, that this apophyſis, or proceſſus Ravianus, has often been found, in diſſection, in ſuch a condition as to render it ſuſpected of not being a real bone. It is often flexile and elaſtick, in the manner of the leſſer bones of fiſhes; and, if preſſed any way upon the head, it will bend or give way a little; and, on the removing the preſſure, or leaving it to itſelf, it will recover its true form again.

This flexile and elaſtick quality is not found, however, in any of the other genuine bones, if we except the ribs. It may alſo in its recent ſtate, or even after it is a little indurated, be divided by means of a needle, or any other pointed inſtrument, at its top, into a multitude of fibrillæ, or capillary parts, as if it were indeed no more than an indurated tendon. Ruyſch was the firſt anatomiſt in whoſe lectures this ſingular texture of this part was demonſtrated. It appears from the experiment to be rather of the nature of the ſpines of fiſhes, or to be the indurated tendon of the muſcle, which is inſerted in that part, than a real and genuine bone.

Some other proceſſes of the ſame nature, examined by the microſcope, and ſituated about the angle marked by the letter *E*, are perfectly cartilaginous; but the reſt, from this angle *E* to the part marked *D*, is found, on a nice examination, to be much more boney in its nature, and indeed to be a kind of peculiar bone, or epiphyſis; and from thence it probably is, that this part is ſo eaſily broken, in the taking out the malleus: which is, indeed, ſo general a caſe, that the very accurateſt anatomiſts of ſome years ago, and particularly thoſe who had profeſſedly treated of the human ear, as Du Verney, Schelhammer, Valſalva, Vieuſſens, and even Mangetus in his Theatrum Anatomicum, have omitted this apophyſis, or epiphyſis, by which ever of thoſe names it may be moſt proper to call it, in their figures. This, however, is the more obſervable; ſince not only Cœcilius Folius, in his Schediſma, entitled, Nova Auris internæ delineatio, publiſhed at Venice in 1645, (a work that fell into our hands ſince the firſt edition of this Compendium) deſcribes and figures it, tho' not with the moſt perfect accuracy; but even Bartholine gives it in his Anatomia Reformata, p. 713.

As the firſt figures of this bone are, however, given at Tab 1. Fig. 1. larger than the life, it has been judged not improper to add another figure of a malleus, with this proceſs, taken from the ear of an infant newly born, in its natural ſize, as at that period of life. This is figured in two views, and ſhews ſome variation in this proceſſus Folianus.

Fig. 2. Repreſents the lower part of the os femoris, with two ſeſamoide bones, not deſcribed by other authors.

A, The os femoris.

B, The internal condyle.

C, The external condyle.

D, The larger of the two new ſeſamoide bones, ſituated in a conſiderable cavity in the external condyle. This, however, in ſome ſubjects, is much larger than it is repreſented here.

E, The leſſer of the two new ſeſamoide bones, ſituated in the internal condyle. This is but very ſeldom met with in diſſection, moſt ſubjects wanting it; but the other is ſeldom wanting.

Fig. 3. Repreſents the larger of theſe two ſeſamoide bones, ſeparated from the cavity in the external condyle, in which it is naturally lodged.

Fig. 4. Shews the leſſer ſeſamoide bone, of the internal condyle, ſeparate.

Fig. 5. Shews the bones of the little finger.

A, The metacarpal bone, to which the little finger is annexed.

B, The firſt phalanx of the finger.

C, A ſeſamoide bone, which is frequently met with between the juncture of the metacarpal bone and the end of this finger, which is annexed to it. This bone is not unfrequently found larger than it is here repreſented,

ſented, and affixed to the tendon of the abductor muſcle of this finger.

Fig. 6. Repreſents the right ſide of a human ſtomach, extended by inflation, and dried, with its valve, or the large circular membrane, which is found in its right orifice, called the pylorus.

A, *A*, *A*, The right ſide of the ventricle, inflated and dried.

B, *B*, *B*, Part of the duodenum, opened and reclinate.

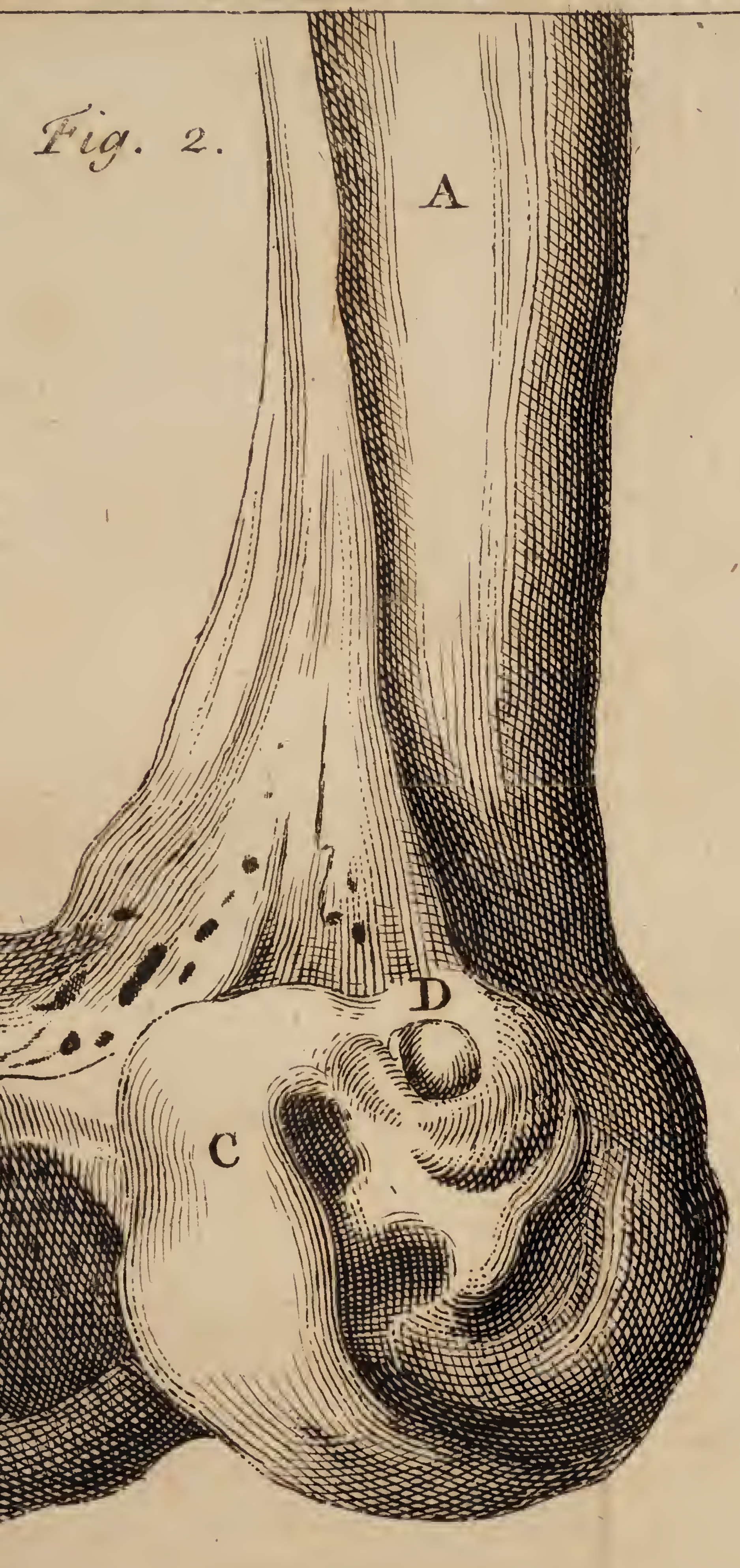
C, *D*, The valve of the pylorus, or the circular membrane, which internally ſurrounds the pylorus in its natural ſituation, as found in the ſubject from which this drawing was taken, in whom it was larger than it is in many others.

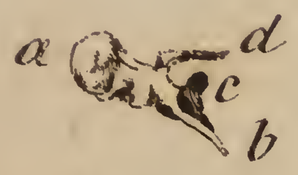
E, The aperture into the ſtomach.

From this figure it appears, firſt, that the pylorus is not ſituated horizontally, as Willis in his Pharmac. Rationalis, Verheyen in his Anatomy, and others, have repreſented it, but obliquely: it is indeed ſo ſituated, that it deſcends or declines from the right ſide *C*, obliquely all the way toward the left ſide *D*. And, beſide this, we ſee by it that the pylorus does not conſiſt merely of a ſeries of circular fibres, ſurrounding this orifice of the ſtomach, as has been generally aſſerted; but uſually of a conſiderably large membrane, which is ſometimes two or three lines broad; ſo that this orifice is well filled by it, and the egreſs of coarſer matter out of the ſtomach is retarded.

We are to obſerve, that this membrane of the pylorus, however, is not ſo large in all ſubjects: ſometimes it is ſcarce more than one line broad; but in ſome it is alſo much larger than here repreſented. The letters *F* and *G* ſhew this membrane in its natural ſize, in another human ſtomach: in this the part *G* is narrower than the reſt; but the part *F*, which is the upper part, is very broad. A figure of this part, communicated to the German Ephemerides, and publiſhed in the fifth century, is unluckily inverted by the error of the engraver.

Fig. 2.





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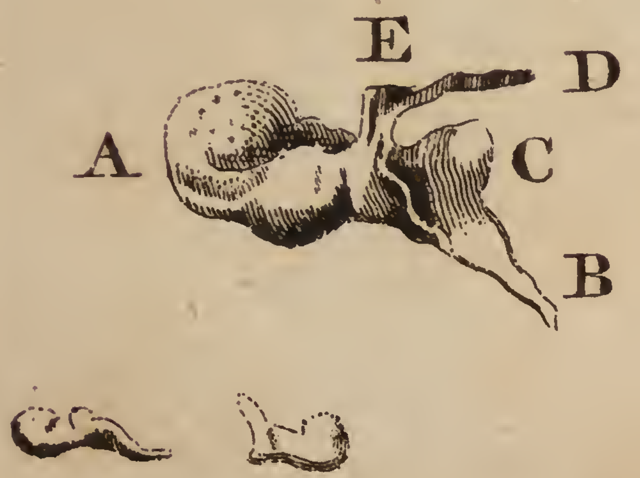

Fig. 1. *

Fig. 3.

Fig. 4.

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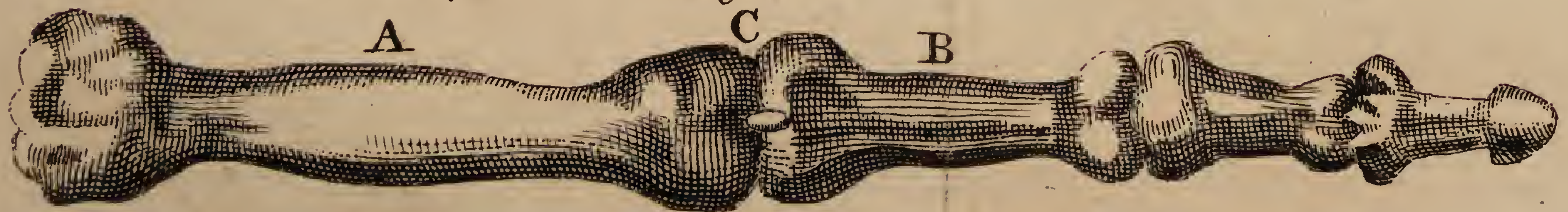

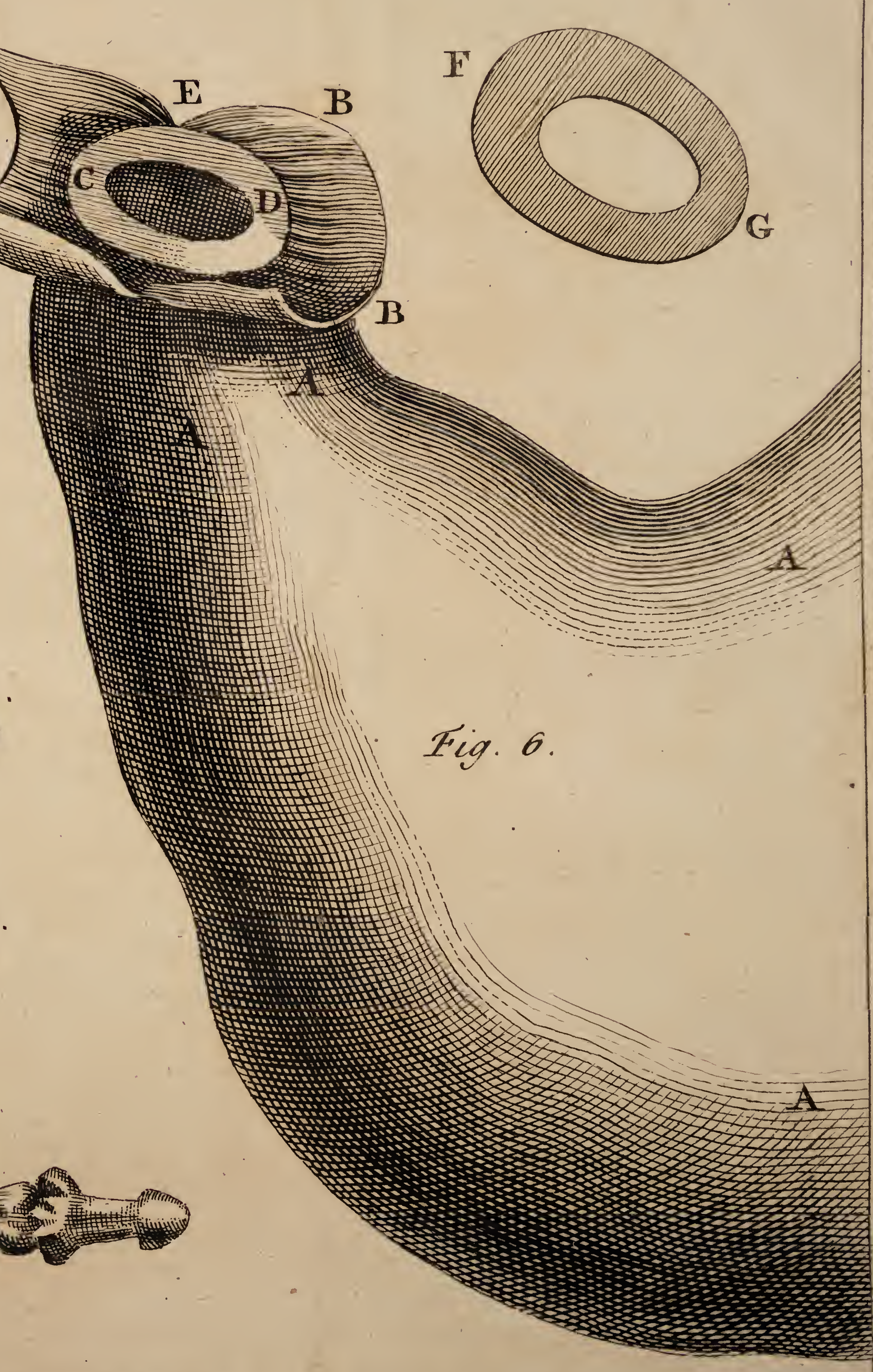

Fig. 6.

J Mynde sc.

Explanation of the Second Plate.

Fig. 7. Repreſents a part of the ileum, cœcum, and colon, with the valve called valvula coli Bauhini. In a diſſertation of our author's, expreſly on the ſubject of this valve, there are ſeveral different figures of it; particularly two ſingular varieties of it are exhibited in the ſecond Tab. Fig. 1 and 2; the one, in which all theſe parts are very large; the other, in which they are very narrow. In this plate there is given a figure, expreſſing it in a middle ſtate, and as it is moſt frequently met with: by this and the others it will appear, that notwithſtanding all theſe, and a number of other variations, there ſtill is, in reality, a valve, ſuch as is called by Bauhine valvula coli, ſituated at the end of the ileum; and that it is not a feigned or imaginary part, as Bianchus would perſuade the world to believe, in Mangetus's Theatrum Anatomicum.

A, *A*, The ileum, aſcending obliquely, as is its uſual and natural courſe, to the larger inteſtine, and inſinuating itſelf into its left ſide.

B, The inteſtinum cœcum.

C, The vermiform, or worm-like proceſs of the cœcum, turned upwards.

D D D D, Part of the cœcum, and of the colon, laid open, that the interior ſurface may be ſeen.

E, The aperture of the valve, or of the ileum, into the larger inteſtines.

F, The upper part of the valve.

G, The lower part of the valve.

H H, Membranes ſupporting this valve; or, more properly ſpeaking, theſe valves on each ſide, which may be called the ligaments or frænula belonging to it.

I I I, Several connivent valves of the colon.

Fig. 8. Shews the lacteals, as found in two diſſections of human ſubjects, mentioned in the note on that ſubject.

A A A, Part of the jejunum, with its rugæ or plicæ, which are ſlightly tranſparent.

B B B B, A vaſt number of roots of the lacteals. Theſe were greatly more numerous in the ſubject than the perſon employed to engrave them could expreſs, and made a multitude of anaſtomoſes with one another: they are much more numerous in human ſubjects than in dogs, from which they have uſually been figured.

C C C C, Their various ramifications, and ſpreading on the meſentery; which was alſo, in nature, vaſtly more than the niceſt hand could expreſs in a figure: they communicated here alſo with one another, by frequent anaſtomoſes; and partly inſinuated themſelves into the glands of the meſentery, partly paſſed over them.

D D D, Some of the larger glands of the meſentery: beſide theſe, there appeared in the ſubject itſelf a multitude of other ſmaller.

Fig. 21. Tho' not properly belonging to this plate, is added, becauſe there was room for it. It exhibits the diſtribution of the auditory nerve thro' the labyrinth of the ear, as it is deſcribed in Noveſius's Epiſtles.

A, The auditory nerve.

B, Its diſtribution thro' the cochlea, in form of a filament.

C, Its progreſs thro' the veſtibulum.

D, Its windings thro' the three ſemicircular canals.

F, Its extremity returning to the brain, and diſperſed thro' it in a multitude of branches.

Explanation of the Third Plate.

Fig. 9. Exhibits three views of the tortuous courſe, and the valves of the ductus biliaris cyſticus, with part of the gall-bladder, as theſe parts appear in moſt ſubjects.

A A, Part of the veſicula fellis, or gall-bladder, opened.

B, Its exit into the cyſtick duct, which is very tortuous.

C, The cyſtick duct, which is twiſted in the manner of a rope, and has within it a number of ſpiral valves.

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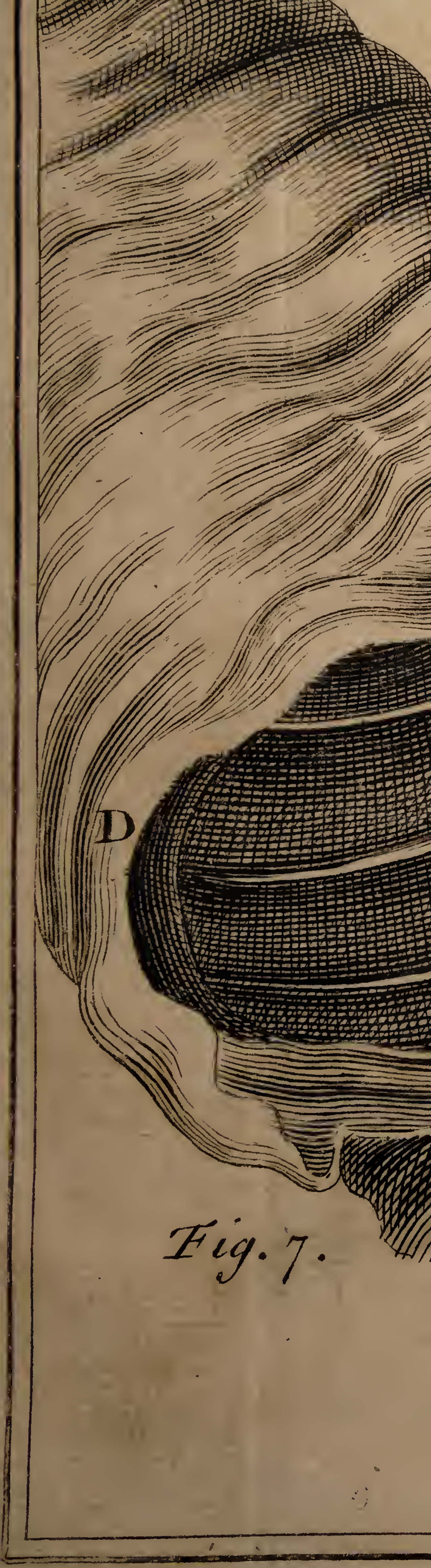


Fig. 7.

Fig. 9. *D*, Exhibits another gall-bladder of this kind.

E, Is its exit, and inflexion, as it were, in the form of the Greek *Sigma.*

F F, The cyſtick duct opened, and ſhewing the ſpiral valves, formed in a different manner from thoſe expreſſed in the former figure.

Fig. 9. *G*, Exhibits another gall-bladder, which has within it various cellules and membranes, ſome tranſverſe, ſome ſtrait, and ſome oblique; but all of them perforated, for the paſſage of the bile and patent: theſe would not admit a ſtyle, indeed, into the cavity; but they eaſily and readily ſuffered the wind to paſs, in inflation.

Theſe valves have been diſregarded by moſt of the anatomical writers to this time; but, on a careful ſearch, they are uſually to be found. Something of valves is to be met with, in almoſt every ſubject; but the diſpoſition is very different: every anatomiſt, who will ſeek after them, will find this. Bianchi, at one time, denied the exiſtence of any ſuch parts; but he afterwards owned, that they were almoſt always to be found, tho' in very different forms.

Fig. 10. Exhibits one of the tubæ Fallopianæ of the uterus, from Drake's Anthropologia, with its veſſels filled with crude mercury, and by inflation, in order to ſhew their courſe in one of the alæ veſpertilionum; together with the reticular diſtribution of the veins on the ſides of the tubæ, and its expanſions or fimbriæ: by means of theſe, theſe parts in the orgaſmus of the cavity are diſtended, erected, and rendered fit for the embracing the ovary of that ſide; as well for the conveying the ſemen from the uterus to the ovary, as for the receiving the ovum impregnated by it, and conveying it into the uterus.

A, The part of the tube that is next to the uterus.

B, Its other extremity, which is ſomewhat narrower again than the middle, before it expands into the fimbriæ at its mouth.

C C, The fimbriæ, or membranaceous expanſions of the tube, diſtended.

D, The orifice of this end of the tube diſtended.

E, The veſpertilionis ala of that ſide.

F, Its veins and arteries coming from the hypogaſtricks.

G, The veſſels, forming a wonderful reticular or cavernous body in the ſides of the tubæ.

Fig. 11. Another view of a Fallopian tube, with its veſſels filled with mercury, as exhibited in a publick diſſection, by the author. In this the diſtribution of the veſſels appear very different from Drake's repreſentation, copied in the former figure, and much more beautiful.

A, The part of the tube which is neareſt the uterus, tied with a thread: otherwiſe the mercury, thrown into the veſſels, will make its way into the uterus and the hypogaſtrick veſſels, and the veſſels of the tube will not be thoroughly filled.

B, The other extremity of the tube in this.

C C, Are the fimbriæ, or membranaceous expanſions, which are extremely full of veſſels, tho' very minute ones, to their very utmoſt verge. No hand is fine enough to expreſs, in engraving, the multitude of theſe viſible in the ſubject.

D, The opening of this extremity.

E, The ala veſpertilionis, or the ligament between the tube and the ovary. This, when the mercury was firſt thrown in, was very full of it; but the mercury made its way ſoon out at an aperture ſcarce perceptible, and in a great meaſure emptied it again.

F, The vein, at which the mercury was injected, ariſing from the ſpermatick of the uterus.

G, Its larger diviſions.

H H, A remarkable branch of it, running parallel, as it were, with the tube, nearly as the veins of the inteſtines do in the meſentery. From this parallel branch there proceed

I I, A multitude of leſſer branches, which ſpread themſelves upon the tube, nearly as the veſſels in the inteſtines; and fill it afterwards with ſuch innumerable ramifications, that the whole ſubſtance of the tube appears nothing but a congeries of them. The veſſels of the Fallopian tubes are, indeed, to the full as numerous as thoſe of the pia mater, the heart, or any of the other parts, according to Ruyſch's figures; and yet it has happened, that authors in general have deſcribed and figured them as if they had no veſſels at all. It is not a wonder, therefore, that theſe parts are capable of erection in the coitus, ſince the copious flow of blood into theſe numerous veſſels at that time cannot but occaſion it: we ſee that it may indeed be done, in ſome degree, by inflation.

Fig. 12. Exhibits the liver of a new-born fœtus.

A A A, The circumference of the liver.

B B B, The lower part of the liver, in which there are ſeveral inequalities.

C, The gall-bladder.

D, The umbilical vein, running with a ſingle trunk from the navel to the liver.

E E, The ſinus's of the vena portæ, into which alone the umbilical vein inſerts itſelf, with a ſingle trunk, tho' Verheyen has deſcribed it much otherwiſe.

F, The trunk of the vena portæ cut off.

G, The principal branches of the ſinus of the vena portæ diſtributed thro' the liver. Theſe become conſpicuous when a ſmall part of the ſuperficies of the liver is abraded off.

H, The trunk of the vena cava.

I I, The canalis venoſus, or ductus venoſus, ariſing from the ſinus of the vena portæ, over againſt the ingreſs of the umbilical vein, and inſerting itſelf into the vena cava: this in the uterus carries a great part, probably indeed the greater part of the blood carried, thro' the umbilical vein to the liver of the fœtus, by a large paſſage to the vena cava and the heart; but this, after the birth of the fœtus, gradually grows narrower, and cloſes.

K, The place of the entrance of the umbilical vein into the ſinus of the vena portæ alone, with one ſingle extremity, not two, as Verheyen and ſeveral other writers have improperly deſcribed it.

Fig. 13. The diaphragm, viewed from the lower part, or in the natural poſition in which it is placed in the body. In the former editions of this Compendium the figure was leſs correct; and it is to be obſerved, that the figures of Verheyen and Mangetus repreſent it inverted alſo, or ſeen from the upper part. The young ſtudent in anatomy may eaſily be perplexed with ſuch a view; this figure is therefore done from the part in ſitu, in a human ſubject.

A A A A, The upper muſcle of the diaphragm, ariſing by fleſhy fibres, conſiderably robuſt and thick, from the ſternum and the cartilages of the ribs. Theſe fibres all run toward the tendinous part, like rays from a centre.

B B, The lower muſcle, which is, as it were, double.

C, Its right tendon, which is the longer.

D, Its left tendon, which is the ſhorter.

E E, The tendinous part, or centrum tendineum, to the upper part of which the pericardium adheres, in which there are tendinous fibres, which, as Santorini obſerves, are wonderfully interwoven with one another, for the ſake of ſtrength.

F, A tranſverſe foramen, or hole in the tendinous part, of an elliptick figure, thro' which the vena cava paſſes.

G, A foramen of an oblong ſhape in the fleſhy part, thro' which the œſophagus makes its way to the ſtomach.

H, The interſtice, a place between the two heads of the lower muſcle, where the aorta deſcends from the thorax into the abdomen; and thro' this paſſage alſo the ductus thoracicus, and the vena azygos, often aſcend out of the abdomen up into the thorax.

I, A fleſhy part of the diaphragm, which, in ſome ſubjects, is tendinous.

K, Two muſcular appendages, which are of very various ſhape in different ſubjects; and in ſome are abſolutely wanting, in others very conſpicuous.

Fig. 9.

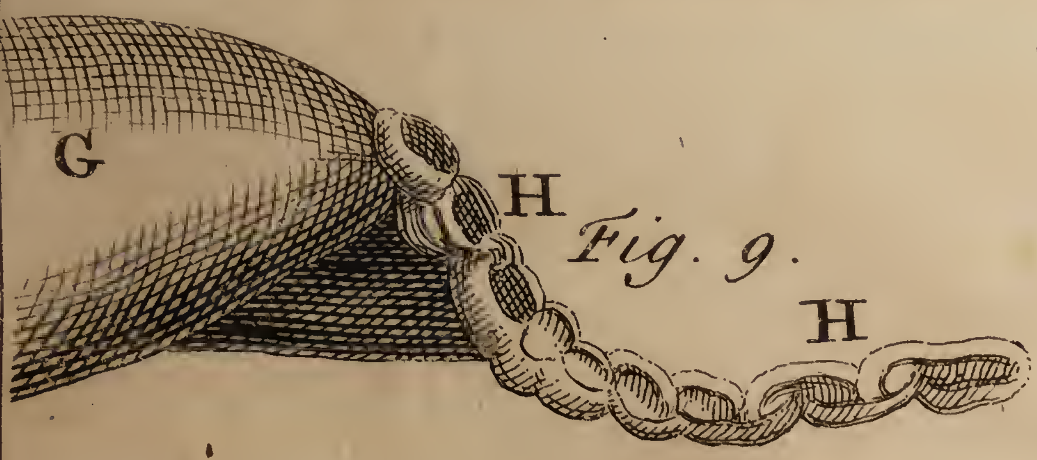
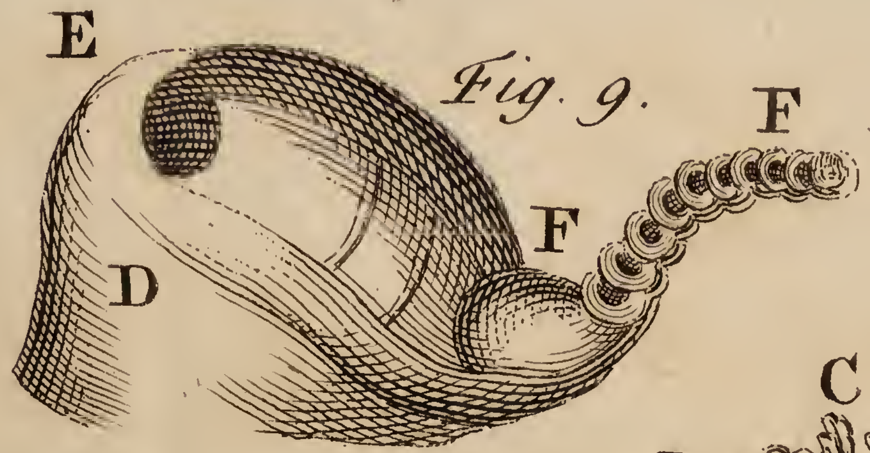


Fig. 9.



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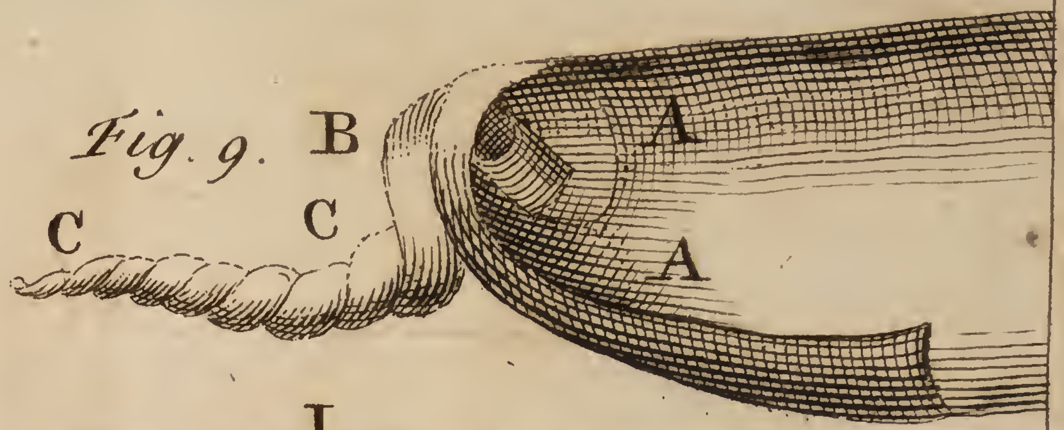

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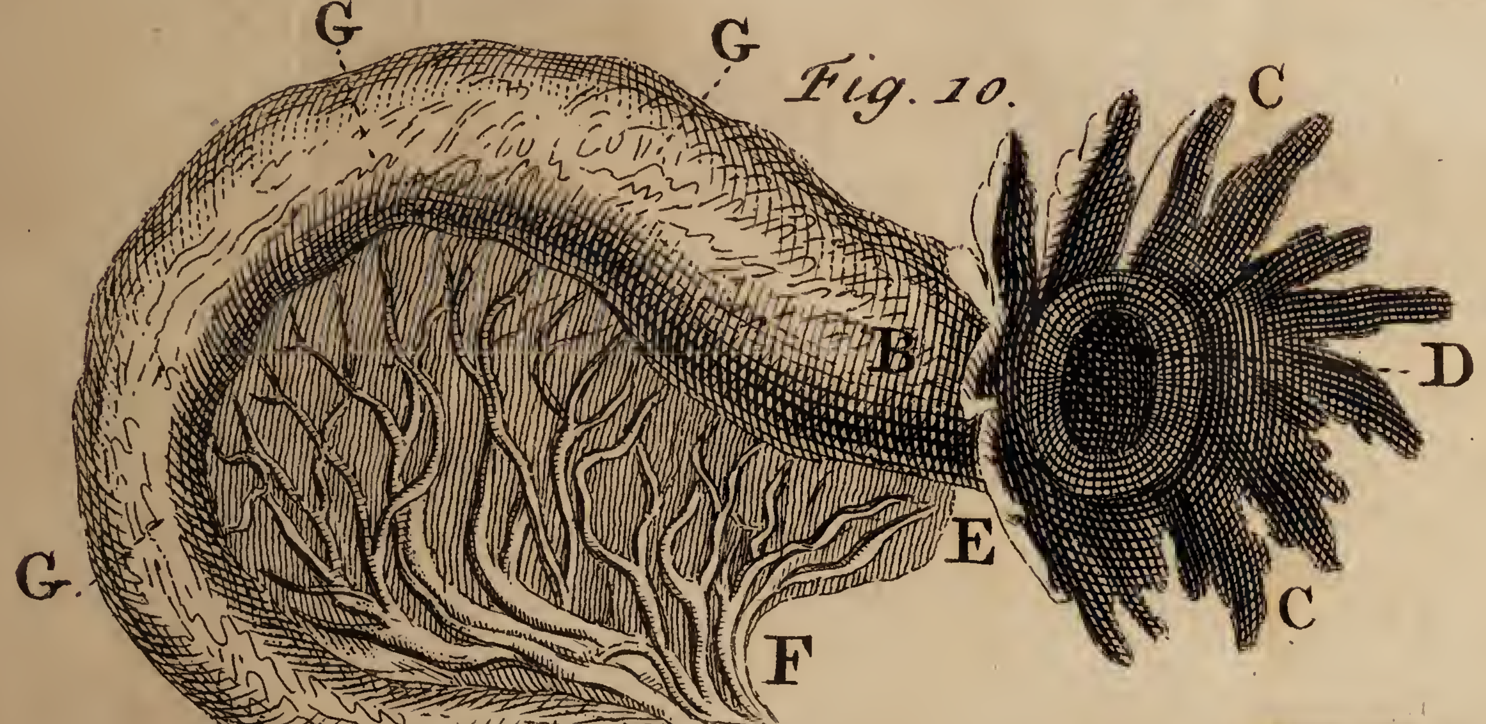

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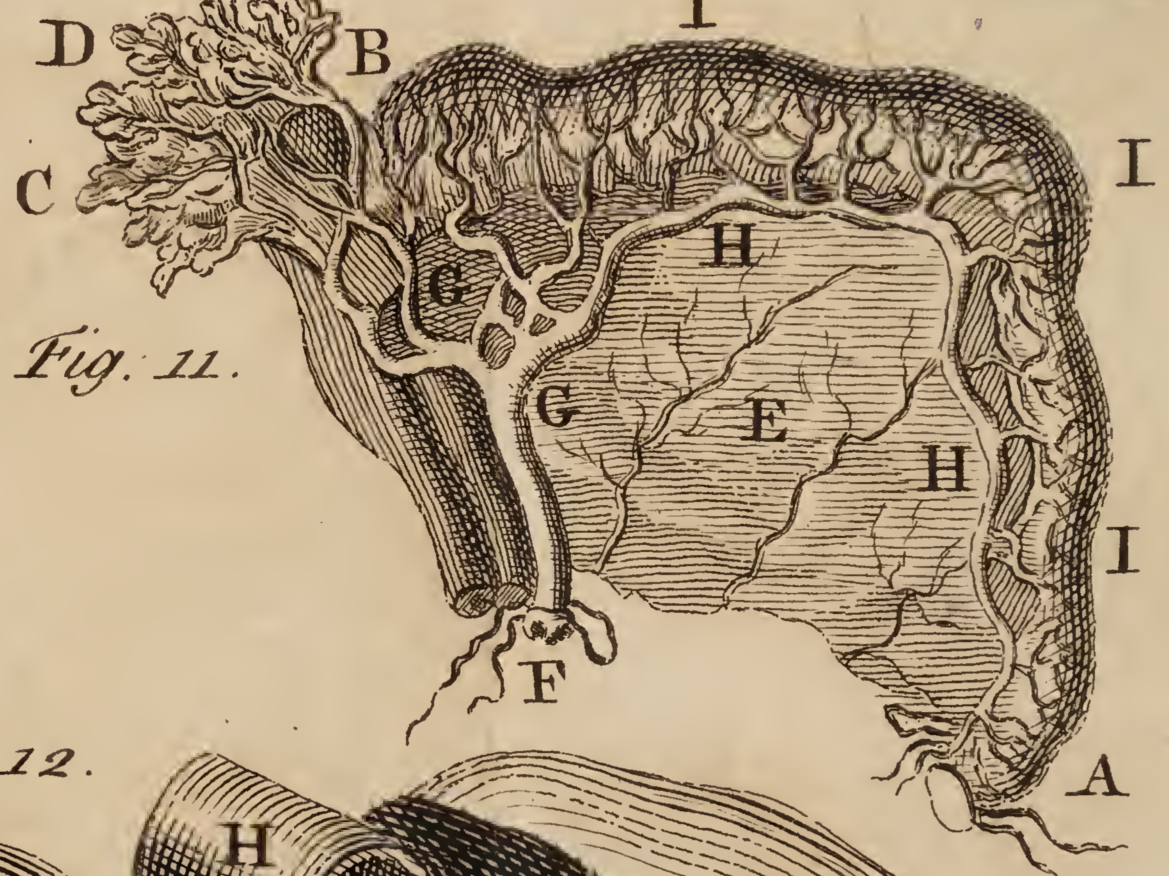

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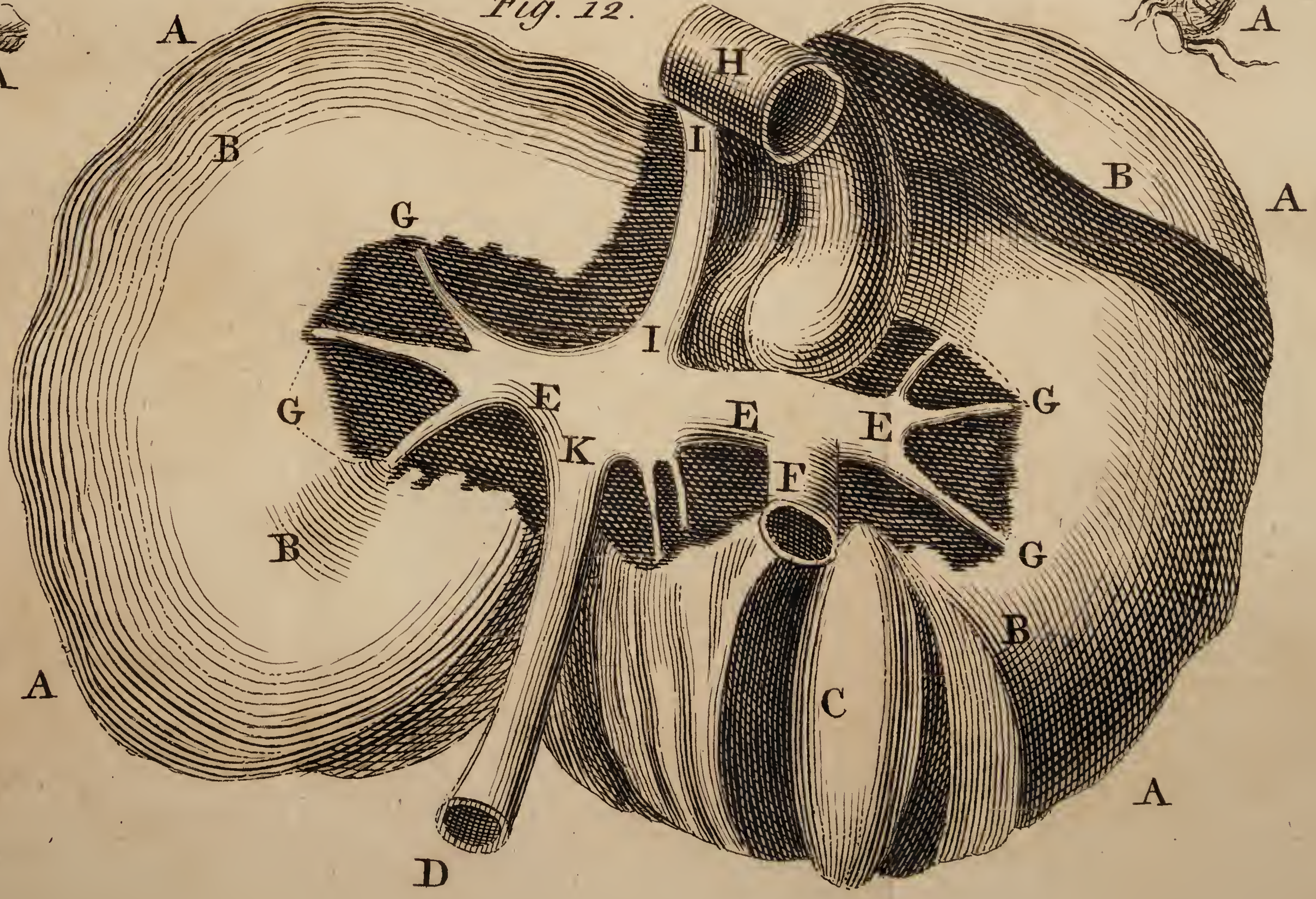
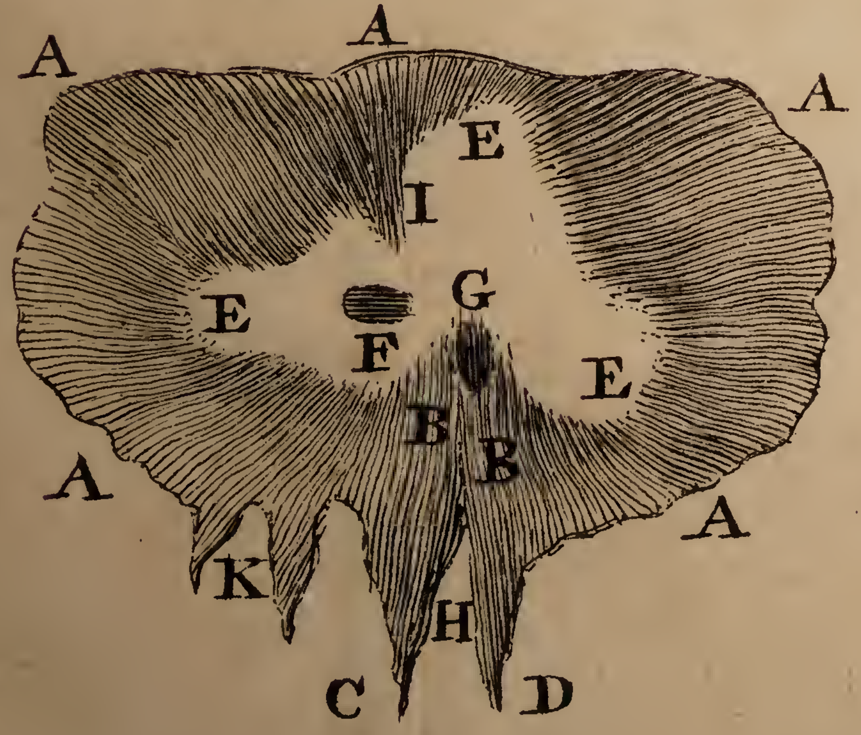


Fig. 13.



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Explanation of the Fourth Plate.

Fig. 14. Repreſents the gland thymus, taken from a fœtus juſt born.

A A, The heart, wrapped in its pericardium, to which the thymus in great part adheres.

B B, The thymus, as it appeared in this fœtus, bifid, as it were, in its lower, and trifid in its upper part: the lower parts, marked *a a*, adhere to the upper part of the pericardium; the middle part, marked *b b*, to the trunk of the aorta; and the upper parts, *c c c*, lie upon the beginnings of the aſcending branches of the aorta.

C C C, The three aſcending branches of the aorta.

Fig. 15. Exhibits the ſame gland taken from another fœtus, and differing from the former in many particulars. This gland is, indeed, extremely ſubject to vary; and is ſcarce found of the ſame ſize, or any thing exactly of the ſame ſhape, in any two fœtus's.

A A, The upper part of the heart, ſurrounded with its pericardium.

B B, The gland thymus, divided in the upper part into two portions, *a a*; and in the lower part only lightly ſinuated, not divided to any depth, *b*.

C C C, The three aſcendent branches of the aorta, as in the preceding figure.

Fig. 16. Repreſents the human cerebellum, exhibiting its diviſion into lobes; a circumſtance which the anatomiſts have been uſed to overlook.

a a a a, The human cerebellum, divided perpendicularly, and into equal parts, in the middle.

B B B, The interior cortical and medullary part.

c c c, The medullary tracts, not ſo thick or ſhort as they are uſually repreſented by authors.

d d d, The diviſions of the cortical ſubſtance, firſt, into larger lobes; and from theſe, into others much ſmaller; and, finally, into a great number of very minute lobuli, beautifully diſpoſed in ſuch a manner, that every larger lobe has its own proper medullary branch; and every ſmaller, nay, every minute lobulæ of the laſt diviſion, has its own little branch of the medullary ſubſtance, every one diſtinct and ſeparate from all the reſt; but all of them at length uniting near the medulla oblongata, and forming one trunk. It would not be eaſy to mark all theſe lobes and diviſions by letters in the figure; but the drawing is ſo diſtinct, that they will be eaſily underſtood by it.

e e, The medulla oblongata.

f f, The beginning of the ſpinal marrow.

In the fifth century of the German Ephemerides there is a method laid down of preparing this part, and keeping it in ſpirits, ſo that all the ſtructure and fabrick of it may be plainly ſeen.

Fig. 17. Repreſents the cerebellum of a calf. This is alſo vertically divided in the middle, with ſome of the parts annexed, that a comparative view may be given of the lobuli of the cerebellum in this animal.

a a a a a a a, Shew the larger or principal lobules of the cerebellum of this animal.

b b b b b b, Exhibit the principal diviſions of the lobules of the cerebellum, which have been generally ſuppoſed to form only one continued ſubſtance.

c c, The principal medullary tracts; from which the ſmaller ones are propagated, and divaricated in the manner of the branches from the trunk of a tree.

d d, The crura of the cerebrum cut off.

e, A fiſſure or chink at the infundibulum.

f, The glandula pinealis.

g g, The nates.

h h, The teſtes.

i i, The fourth ventricle of the brain, or calamus ſcriptorius, in the middle of which there is a dent or depreſſion in the upper part.

k, The anus, or the orifice at the aquæduct of Sylvius.

Fig. 18. Exhibits a recent eye of a hog, which has been expoſed to the winter's air, and frozen, in order

to keep the humors in their proper ſituation. It is vertically cut thro', to ſhew the ſituation of what are called the three humors of the eye, and of the uvea.

a a, The cornea.

b b b, The circumference of the ſclerotica, and of the choroides and retina underneath it.

c, The uvea, in the centre of which is the pupil.

d d, The ciliary ligament, inſerted near the cryſtalline humor.

e e e, The vitreous humor, occupying the hinder part of the eye.

f, The cryſtalline humor lodged in the ſinus of the vitreous one, included in a membrane, and, as it were, ſuſpended by the ciliary ligament.

g, The aqueous humor, ſituated between the cornea and the cryſtalline; where it is evident that the quantity of the aqueous humor between the cornea and the uvea, that is, in the anterior camera, is much greater than that in the poſterior camera, or between the uvea and cryſtalline, where indeed there is but a very ſmall portion, and, as it were, at their flake only viſible.

Fig. 19. Exhibits a like view of a human eye, frozen, and laid open in the ſame manner: in this the quantity of the aqueous humor, lodged behind the uvea, is ſtill leſs, in proportion to the large portion of it that is before the uvea, than in the former ſubject. There is, beſide this, no other difference very obſervable, except that the cryſtalline *f* is much ſmaller in human ſubjects than in hogs, dogs, calves, ſheep, and other quadrupeds in general, as appears from a diſſection of a great number of eyes of different ſpecies of them.

Fig. 20. Exhibits the human tongue, with its three teguments, which the anatomiſts in general have omitted to remark. Bourdon, indeed, has figured them, but thicker than the life.

A A A, The upper ſuperficies of the tongue, on which there are viſible, in every part, a multitude of papillary and pyramidal eminences.

B, A piece of the exterior tunic, or coat of the tongue, ſeparated from the reſt, and reclined. In this an innumerable multitude of nervous papillæ come in view, adhering to its interior ſurface.

C C, The ſecond tunic, or coat of the tongue, called the corpus reticulare of Malpighi: thro' the foramina of this coat the nervous papillæ, riſing from the third or inner one, make their way to the firſt or outer one.

D, The corpus reticulare, ſeparated from the third involucrum, which is under it, and reclinate.

E E, The membrane, or corpus papillare nervoſum; in which there ſtand numerous eminences, which paſs from this body thro' the corpus reticulare to the outer membrane.

F F, The glands of the tongue, glandulæ linguales: theſe, as well as the papillæ, are much larger and more diſtinguiſhable in the hinder than in the anterior part of the tongue. They are in ſome ſubjects much more numerous than in others.

G, The foramen, uſually found in the hinder part of the tongue. Its figure is uncertain; ſometimes round, ſometimes oval, ſometimes nearly triangular.

Fig. 21. Has already been explained in the account of the ſecond plate, in which it ſtands.

Explanation of the Fifth Plate.

Fig. 22. Shews the human penis, on its upper part; with its veins, and the cavernous ſubſtance, injected with crude quickſilver.

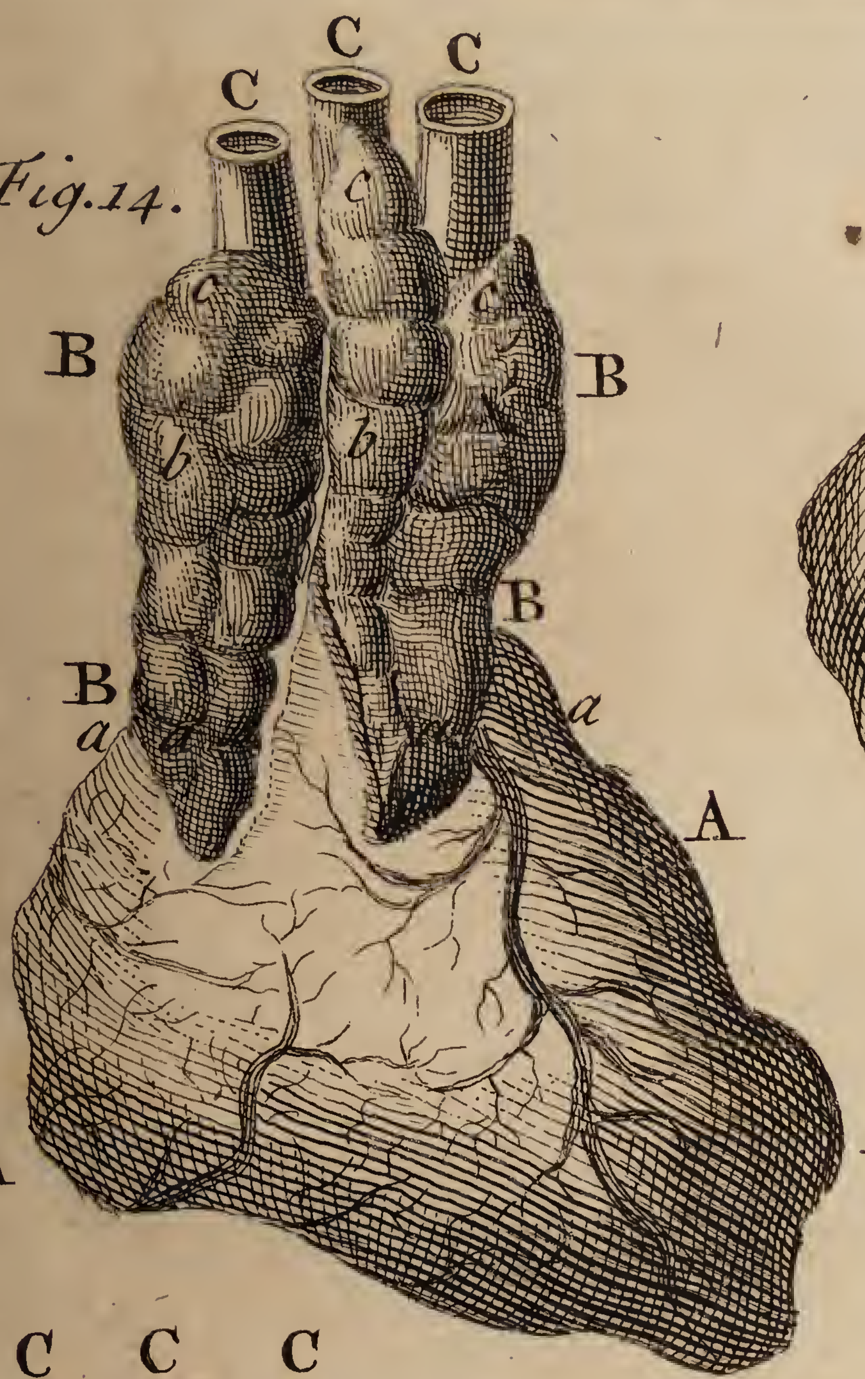
A, The trunk of the vena penis; into which, after piercing its valve, the mercury is eaſily thrown, in ſufficient quantity.

B B, The diviſion of this vein, about the middle of the penis, into two conſiderable branches.

C C, The ſub-diviſions and diſtributions of the ſmaller ramifications from theſe, over the corona, and adjacent parts of the penis.

D D, The ſurpriſing and inextricable courſe of a multitude of extremely minute ramifications from the former veſſels, thro' the whole ſurface of the glans: they

Fig. 14.



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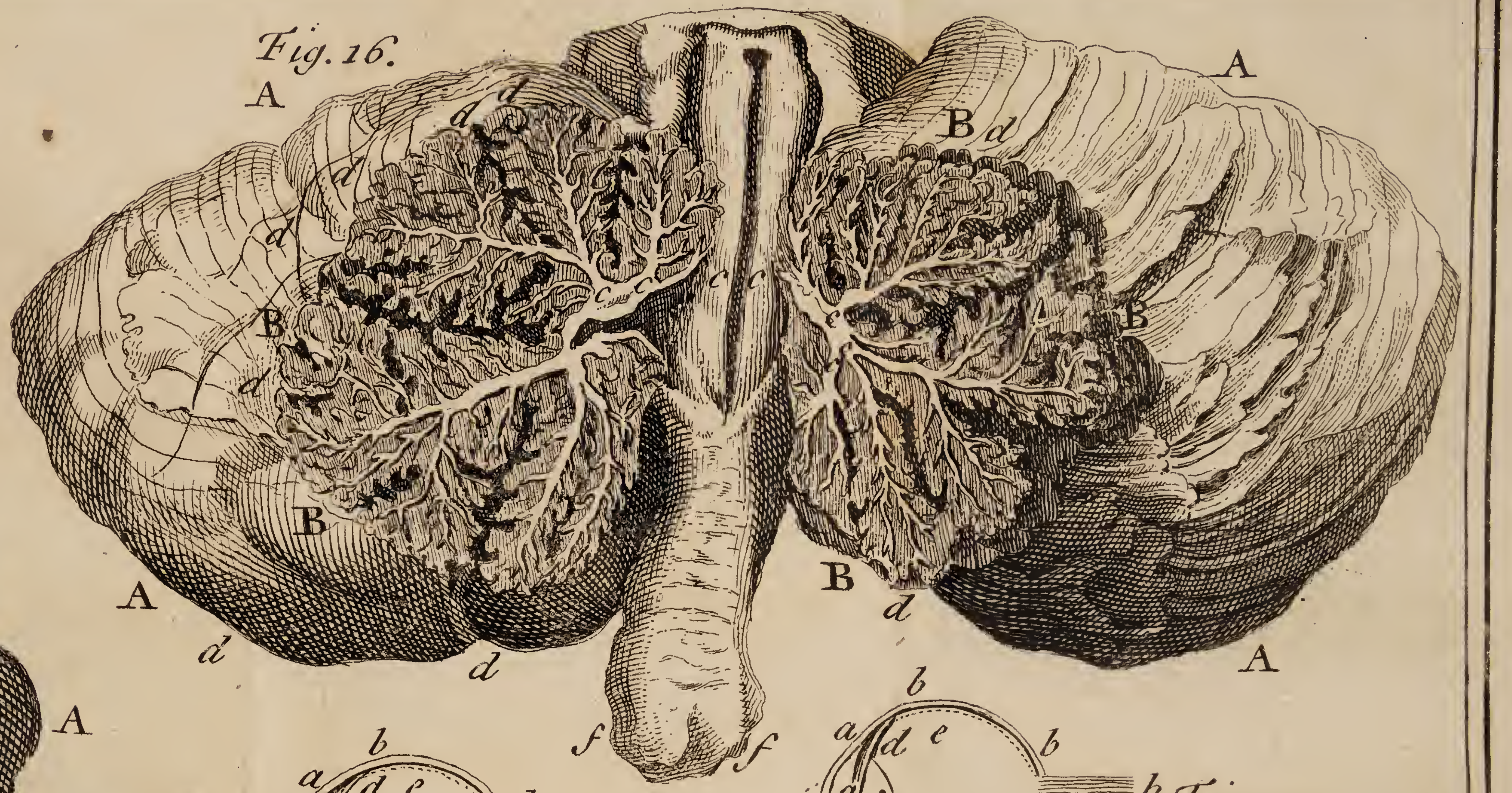

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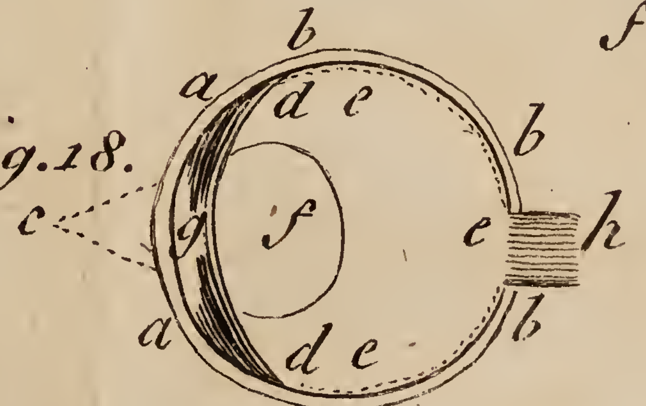

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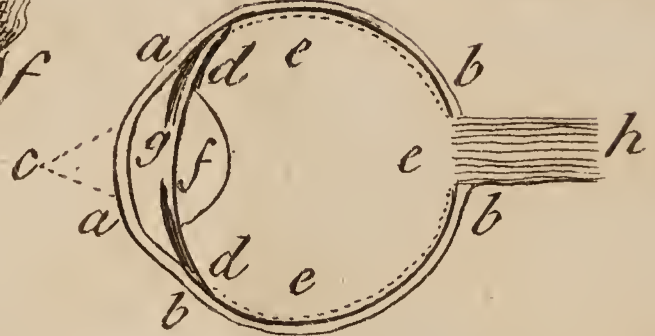

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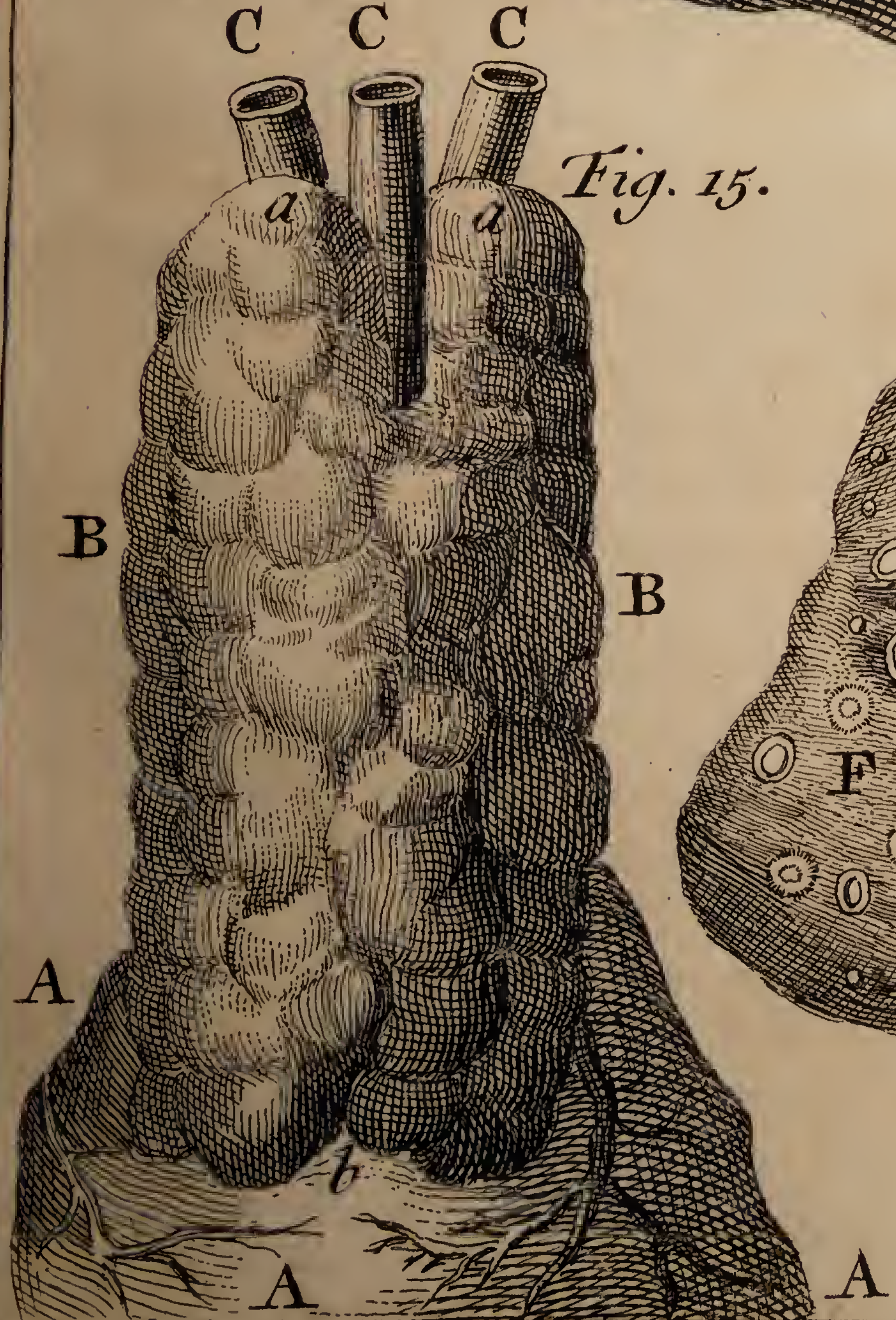


Fig. 20.

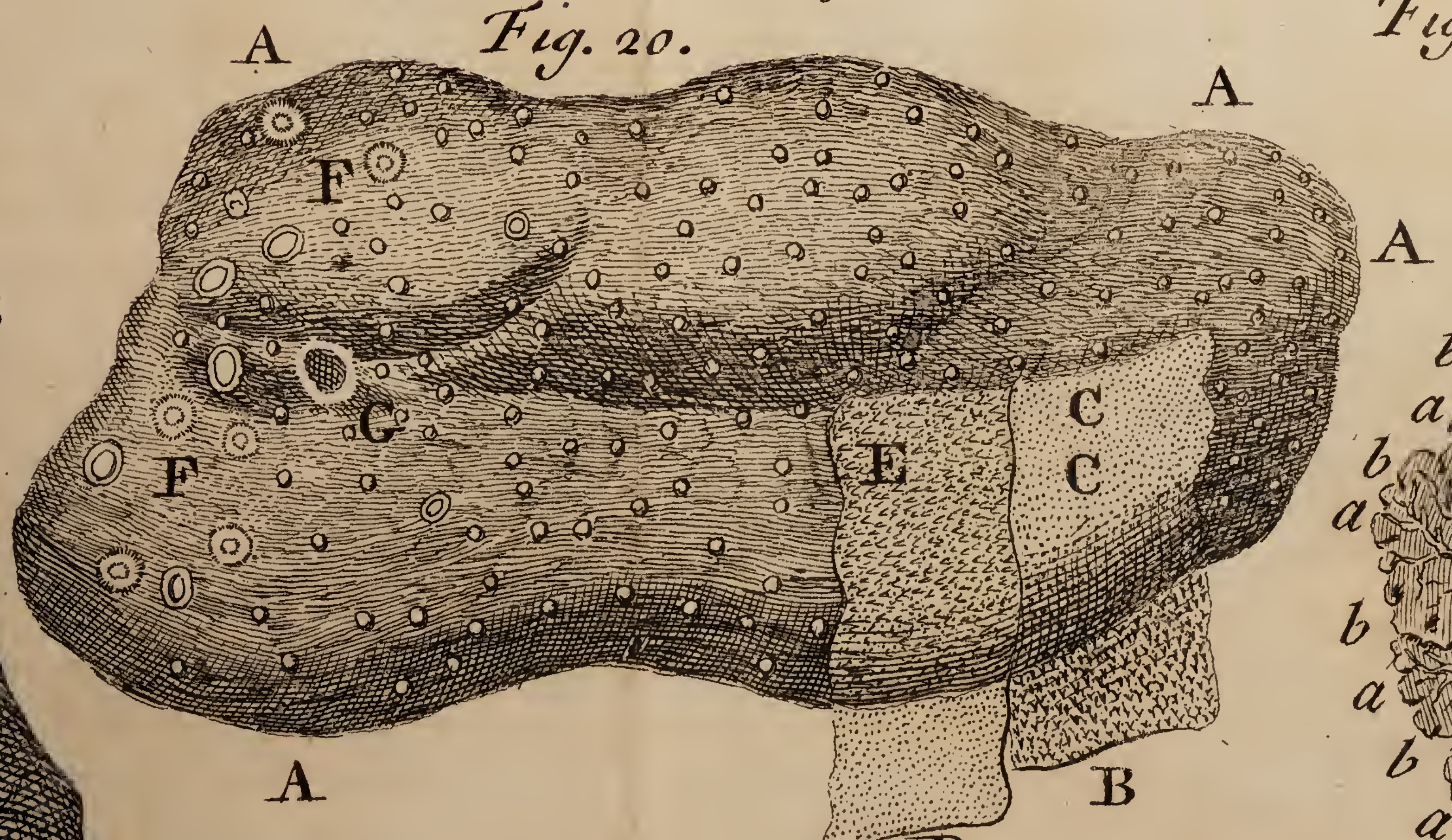
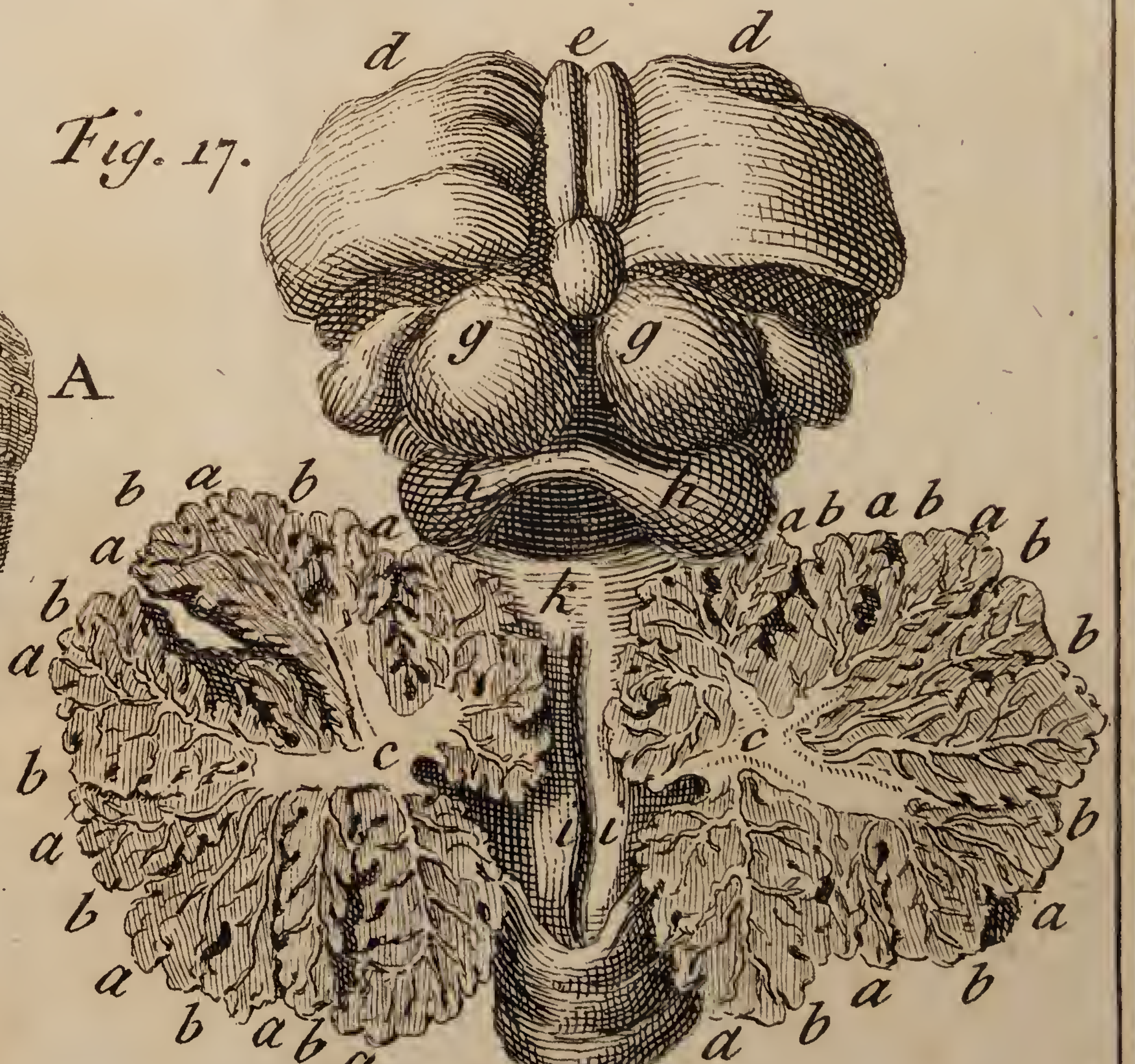


Fig. 17.



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they run here in tortuous and flexuous meanders, in the manner of the inteſtines, or of ſeminal veſſels in the teſticles; and are ſo extremely numerous, that the whole ſuperficies of the glans ſeems intirely compoſed of them.

e e e e, Veſſels of various ſizes; ſome very minute, others larger, ſome very large, which creep along different parts of the penis, ſurrounding and running over and under one another.

F, The termination or extremity of the urethra, where the urine is voided.

G, A cord, with which, after the injection, the hinder part of the penis is tied, that the mercury may not run out again, as it otherwiſe would eaſily do.

H, The hinder part of the penis cut off.

Fig. 23. Repreſents the lower ſurface of the ſame penis, in which the veins, thus filled with mercury, are ſeen running in a ſtrangely irregular and devaricated manner, and making frequent anaſtomoſes one with another over this whole ſurface, and particularly over the urethra. They are extremely numerous in every part of this ſurface of the penis, but particularly about the frænum; where they are, indeed, too elegantly ramified to leave it in the power of an engraver to do them juſtice; but are beautifully ſeen in the preſerved preparations of the part.

A, The frænulum of the penis, furniſhed with a multitude of veſſels finer than hairs.

B B, The corona and neck of the penis, furniſhed with a yet greater number of veſſels of the ſame extreme minuteneſs.

C C, The whole inferior ſuperficies of the glans, full of extremely minute veſſels, like the other ſurface, and theſe ſpreading and devaricating in the ſame wonderful manner.

D D, The urethra, protuberating. The corpus cavernoſum of this part, being filled with the quickſilver, extends it in this manner, and occaſions a beautiful view of the minute and innumerable veſſels which run over it.

E E, The two corpora cavernoſa of the penis, containing the urethra between them, filled alſo with the quickſilver. Theſe, as well as the urethra, are covered with a multitude of veſſels, ſome of them conſiderably large, which run with a number of flexuoſities and anaſtomoſes all over them, and are filled, as the reſt, with quickſilver.

F, The end of the urethra.

G, The cord with which the penis is tied.

H, The hinder part of the penis cut off.

It is not always that a penis can be thus completely and beautifully injected, tho' the ſame caution be uſed in the operation. It frequently happens, that the matter of the injection, thrown in at the vein of the back of the penis, makes its way out by the urinary paſſage: but even miſcarriages of this kind are not without their uſe: we diſcover by this the communication that there is between the urinary paſſage and the veins of the penis, and may make a more natural gueſs at the progreſs of the venereal taint from it than any way elſe.

Explanation of the Sixth Plate.

Fig. 24. Exhibits a drawing of a human teſticle, the ſeminal veſſels of which have been unfolded in the manner firſt taught by Ruyſch.

A, The tunica albuginea of the teſticle, ſeparated from the ſeminal veſſels, and turned back.

B B, The ſeminal veſſels of the teſticle unfolded: in theſe the matter of the ſemen is elaborated: they hang in the manner of hairs; and the whole interior ſubſtance of the teſticle may be ſeen to be compoſed of them.

Fig. 25. Repreſents a human teſticle of a very peculiar ſtructure, demonſtrated in the publick ſchools at Helmſtadt.

A, The deſcendent aorta.

B, The vena cava inferior.

C C, The emulgents.

D, The origin of the ſpermatick arteries from the trunk of the aorta.

Fig. 22.

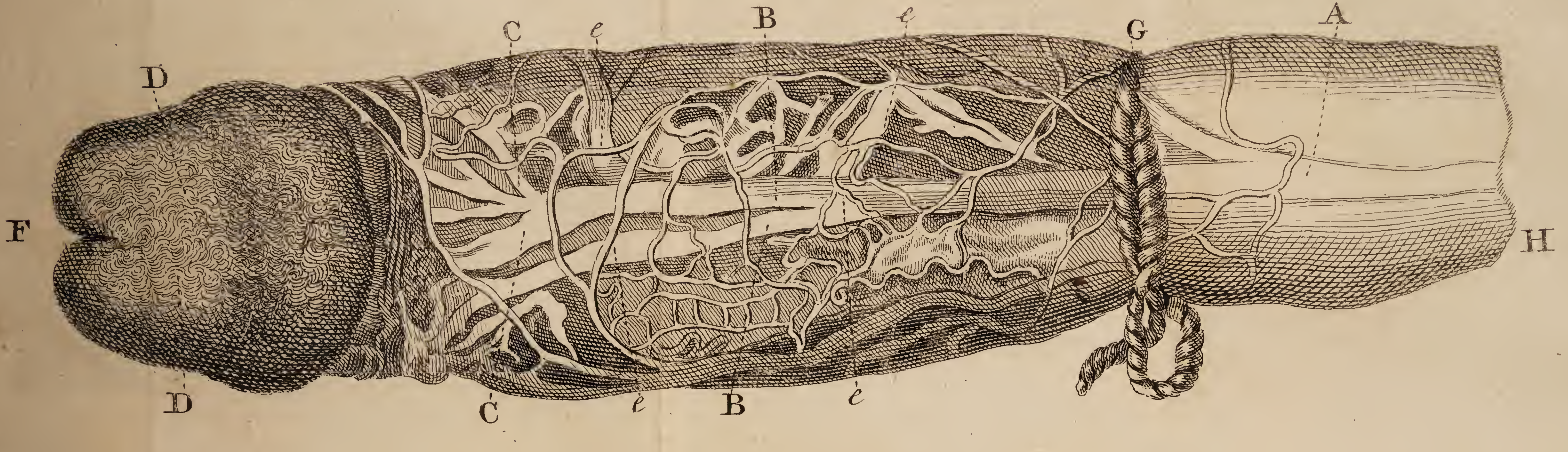
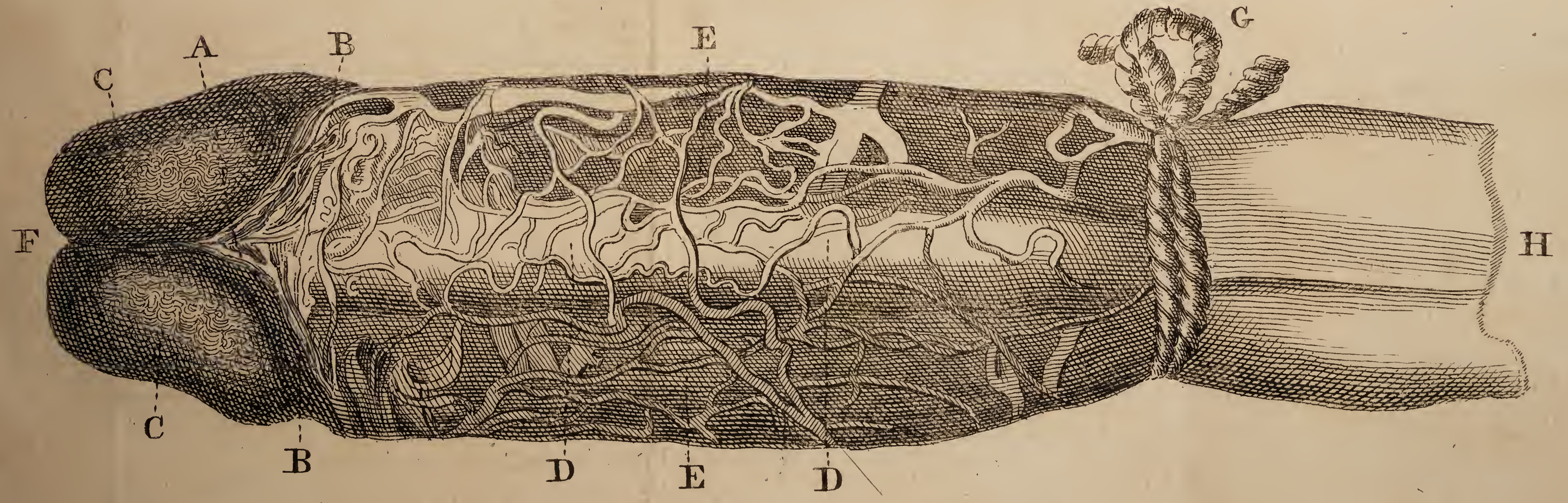


Fig. 23.



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e, The right ſpermatick vein, from the trunk of the vena cava.

f, The left ſpermatick vein, ariſing from the left emulgent.

g, The right ſpermatick vein and artery, folded together in the uſual way, and running to the teſticle.

h, The right teſticle.

i i, The epididymis, taken out of the ſcrotum.

k l, The vas deferens, or ejaculatory veſſel. All theſe three were in their natural condition and ſituation on this ſide.

m, The left teſticle, which had never deſcended into the ſcrotum; but remained in the abdomen, in that part where the ſpermatick veſſels uſually make their way out of the abdomen. This was much ſmaller than the other, and had no epididymis.

n o, Repreſents the epididymis, which, in this ſubject, was almoſt intirely ſeparate from the teſticle: it only adhered to it at *n*. The reſt of it, after paſſing thro' the place uſually deſtined for the road of the ſpermatick veſſels among the muſcles of the abdomen, went out of the abdomen, and extended itſelf quite down to the ſcrotum; ſo that the part marked *o*, which is its lower extremity, was ſituate in the upper part of the ſcrotum.

p, The duct, or vas deferens, as if it had come from the teſticle in the ſcrotum, aſcending again into the abdomen, under the teſticle *m*; whence going on to

q, It emerged again; and, in the uſual way, from the letter

r, Paſſed to the veſicula ſeminalis of its own ſide.

R, The place where the ſpermatick veſſels divided; and part

s, Went to the teſticle; but part

t, Alſo went to the epididymis.

We have opportunity of obſerving, in this *luſus naturæ*, in what an exact and regular manner a part, a little different from the ordinary ſtate, may be formed. In this nothing was wanting; but the parts which are uſually joined, namely, the teſticle and the epididymis, were ſeparated from one another; yet all was provided for.

As the teſticle, in the uſual courſe of nature, ſhould have been in the ſcrotum, but was accidentally lodged, in this caſe, in the abdomen; nature yet took care, that a part of the apparatus of it, namely, the epididymis, with part of the ejaculatory veſſel, ſhould paſs out of the abdomen toward its uſual place: and thus, tho' the fabrick of this teſticle was not of the uſual kind, yet, by this contrivance, it was rendered capable of performing all the neceſſary offices of a teſticle, as much as if it had been conſtructed exactly in the uſual manner. There is no queſtion but that, according to this fabrick, the ſemen might paſs from the teſticle thro' the epididymis to the vaſa deferentia.

Fig. 26. *a a a*, Exhibits the right veſicula ſeminalis opened, recent, but waſhed; ſo that not only its various cellules, but its internal reticulated ſurface, deſcribed by Santorini, come in view.

b b b, The internal reticulated ſurface, appearing like a corpus reticulare; and much reſembling the interior ſurface of the gall-bladder, as Ruyſch has drawn it. In the cells of this reticulation, probably, the ſemen receives a yet farther elaboration than it had had before. The object itſelf, properly cleanſed, exhibits a view of this ſtructure, however, much better than a figure can repreſent it.

Fig. 27. Repreſents a human fœtus of three months: an abortion included, in a beautiful manner, in its membranes, as it were, in an egg, and ſwiming in its own liquor. Every thing is repreſented, in this figure, of the natural ſize.

A, The fœtus, with its large head; the eyes large, protuberant and black, as they uſually are in this ſtate, appearing thro' the liquor and membranes.

B B B, The exterior tunic of the chorion, which is very full of veſſels, which hang every where in great numbers, in the manner of fibrous roots. This is a circumſtance moſt of the anatomical writers had not hit upon, 'till this ſubject occurred.

C C C, Part of the pellucid tunics of the fœtus, from the others of which this vaſcular part is ſeparated, and

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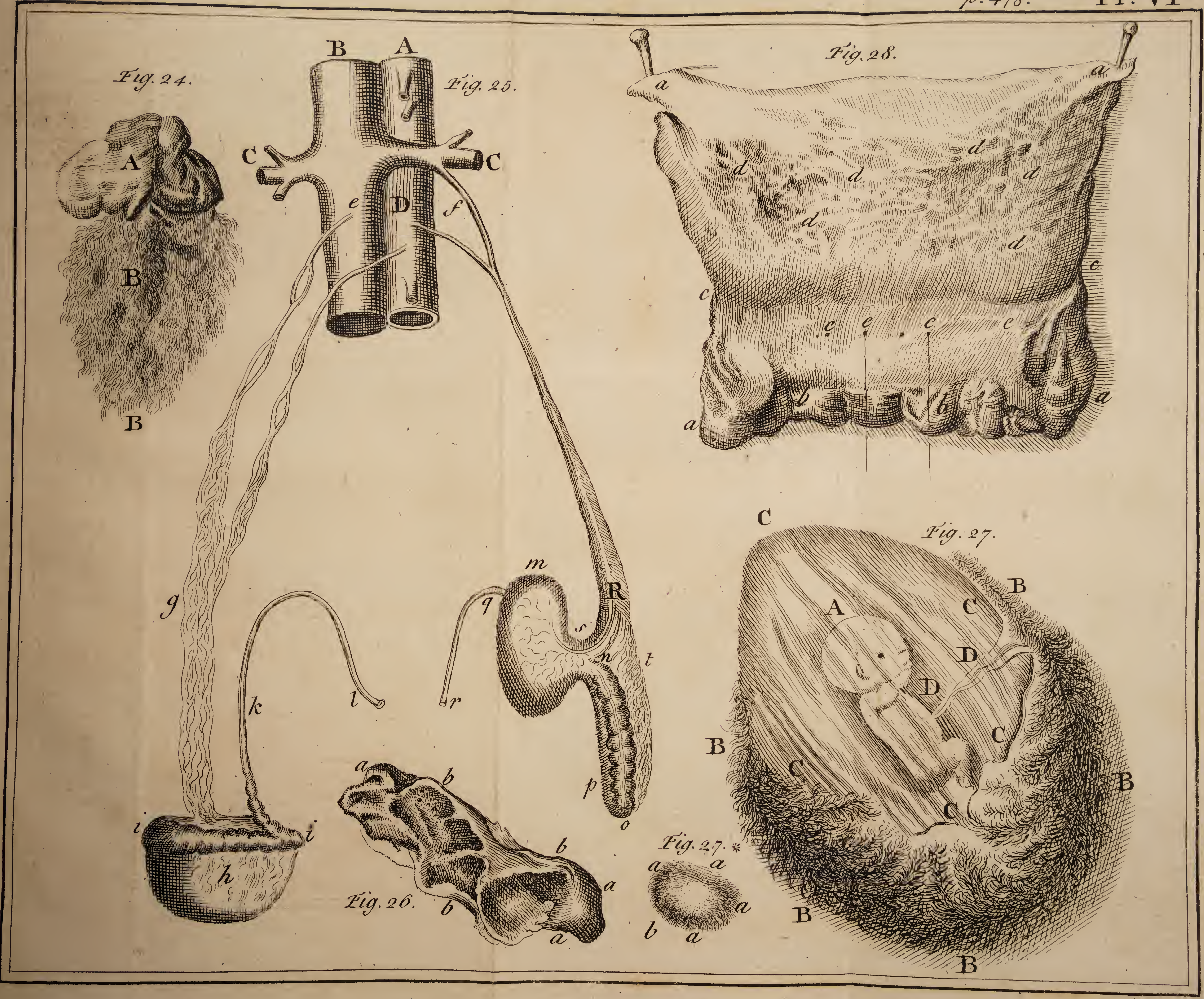

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and drawn back, that it might be in view, together with the fœtus in its liquor. The greater part of this ovum humanum, if we may be allowed the expreſſion, is furniſhed with the ſame kind of fine ſlender fluctuating veſſels.

D D, The funiculus umbilicalis, appearing but in an imperfect manner at this period.

Fig. 27. *a a a*, Exhibits an ovulum from a woman, who was, as herſelf imagined, about a month gone with child: it was evacuated with great pain, and a large hæmorrhage, from the uterus. It is almoſt pellucid, and exhibits in its circumference a great number of veſſels, or radiculæ of the chorion, like hairs.

b, A little corpuſcle viſible in it, and ſeeming the imperfect ſketch of the embryo.

Fig. 28. *a a a a*, Exhibits part of the anus and inteſtinum rectum opened.

b b, Certain unequal and irregular eminences and rugæ in the outer circumference of the anus; where alſo there appeared, in this ſubject, a number of tumid livid veins.

c c c, The margin or verge of the anus, where, from the letters *c c* to *a a* on the under part, there appear a kind of fimbriæ; when the ſphincter and the rectum uſually differ in colour.

d d d d, Expreſs a multitude of very minute apertures or oſcula, about the extremity of the inteſtinum rectum, together with a number of roundiſh glands.

e e e, Certain larger oſcula, or apertures, large enough indeed to admit a hair: theſe are ſituate below the fimbriæ of the rectum, where the ſphincter is placed.

Explanation of the Seventh Plate.

Fig. 29. Exhibits the ileum, colon, cœcum, and its vermiform appendage, as they were found in a new-born infant; diſtended by inflation, and dried.

A A, Part of the ileum, in which is ſhewn its ingreſs into the left ſide of the colon.

B B, Part of the colon.

C, The cœcum; with its change into the proceſſus vermiformis, which is peculiar and different in this ſtate from what it is in adults. In infants of this period the cœcum becomes gradually ſmaller and ſmaller, 'till it forms this proceſs, ſo as in the whole to be of a ſort of conic figure; whereas, in adults, it is much otherwiſe.

D E, The vermiform proceſs of the cœcum, which, in this ſubject, was inflected in a very ſingular and extraordinary manner. It firſt paſſed under the ileum from *C*, and aſcended to *D*: after this it was again reflected above the ileum, and deſcended to *E*.

Fig. 30. The ſame inteſtines preſented in a back view, in order to the ſhewing more diſtinctly in what manner it is that the cœcum is transformed into the proceſſus vermiformis, uſually in infants.

A A, The ileum, with its ingreſs into the colon.

B B, The colon.

C, The cœcum.

D, The beginning of the vermiform proceſs.

E E, The ſingular inflexion of it, in this ſubject, about the ileum.

Fig. 31. Exhibits a proceſſus vermiformis of the cœcum of an adult ſeparated, with its peculiar flexions and gyrations. This is longer than the proceſs uſually is.

A, Its beginning, cut off from the cœcum.

B, Its extremity, turning upwards.

C, Its ſingular flexions.

Fig. 32. Repreſents the longitudinal ſinus of the dura mater; into the ſides of which, in this ſubject, a peculiar tranſverſe ſinus was inſerted.

A A, The open part of the longitudinal ſinus.

B, The place where in this ſubject it divided, accurately and exactly, into two equal lateral ones; which is not the caſe indiſcriminately in all ſubjects.

C C, The beginnings of the two lateral ſinus's.

D D, The lateral ſinus's, cut off in their progreſs.

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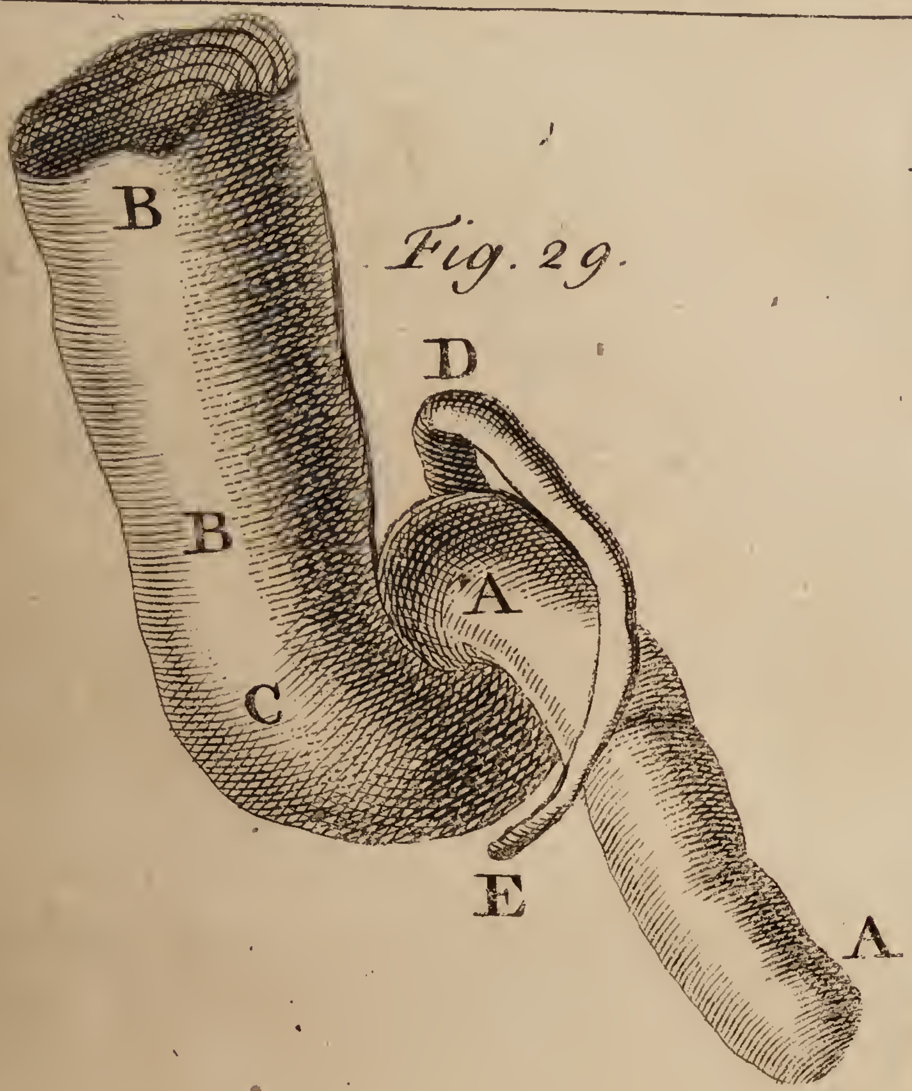

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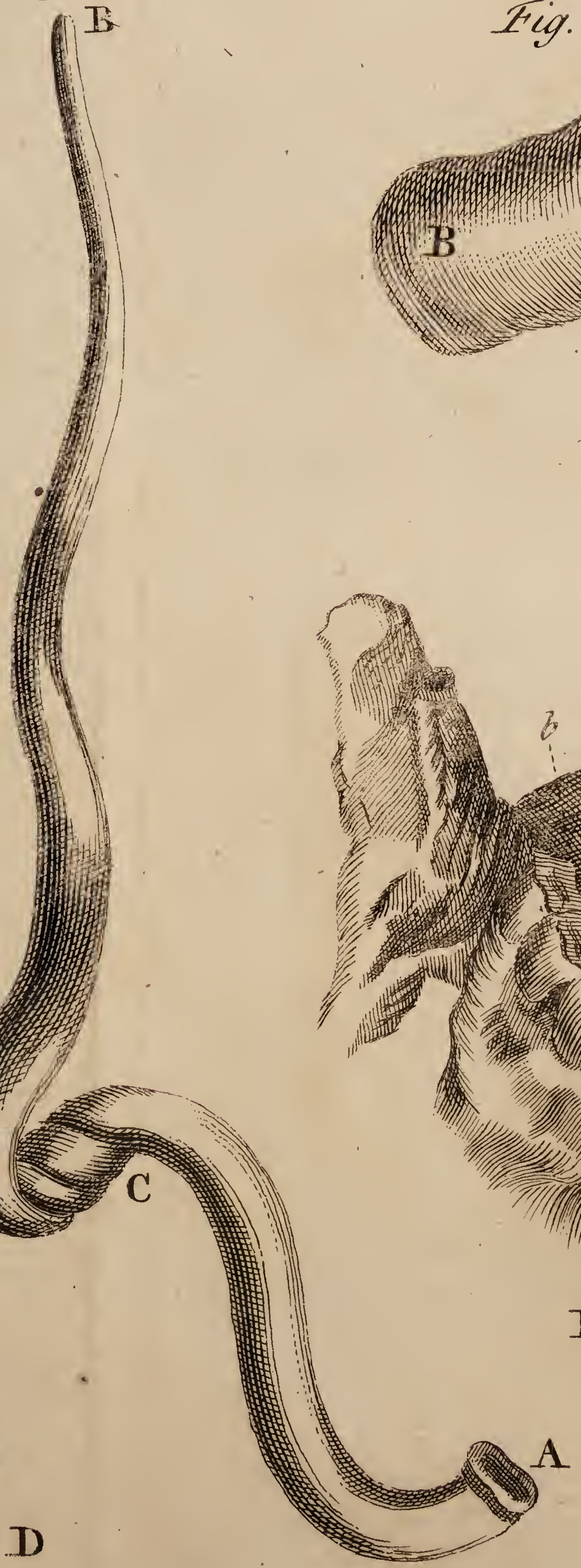

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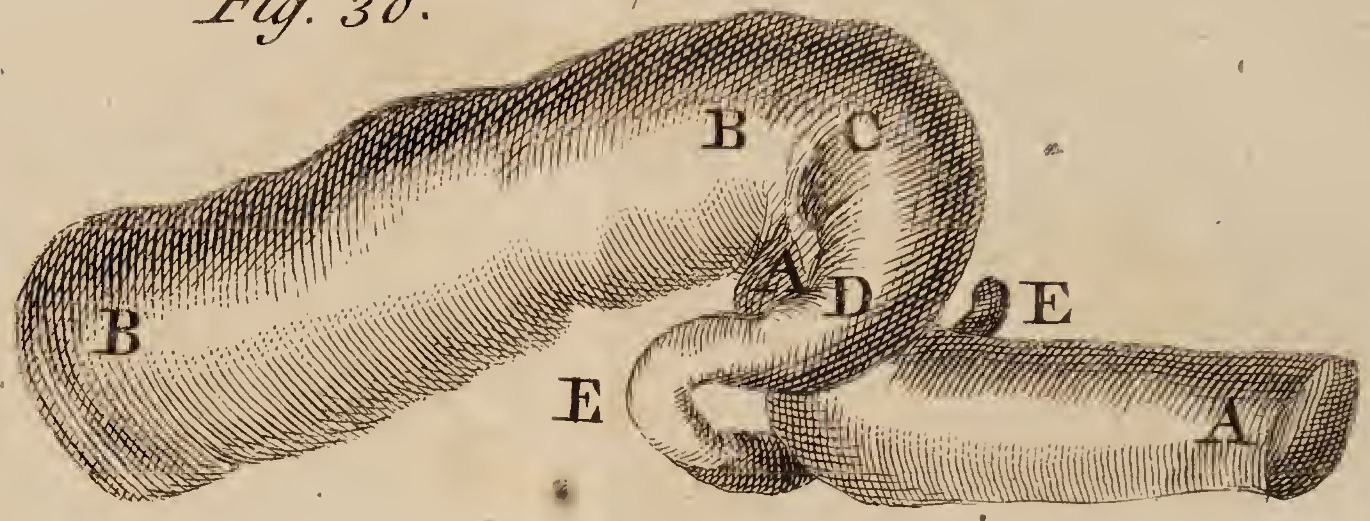

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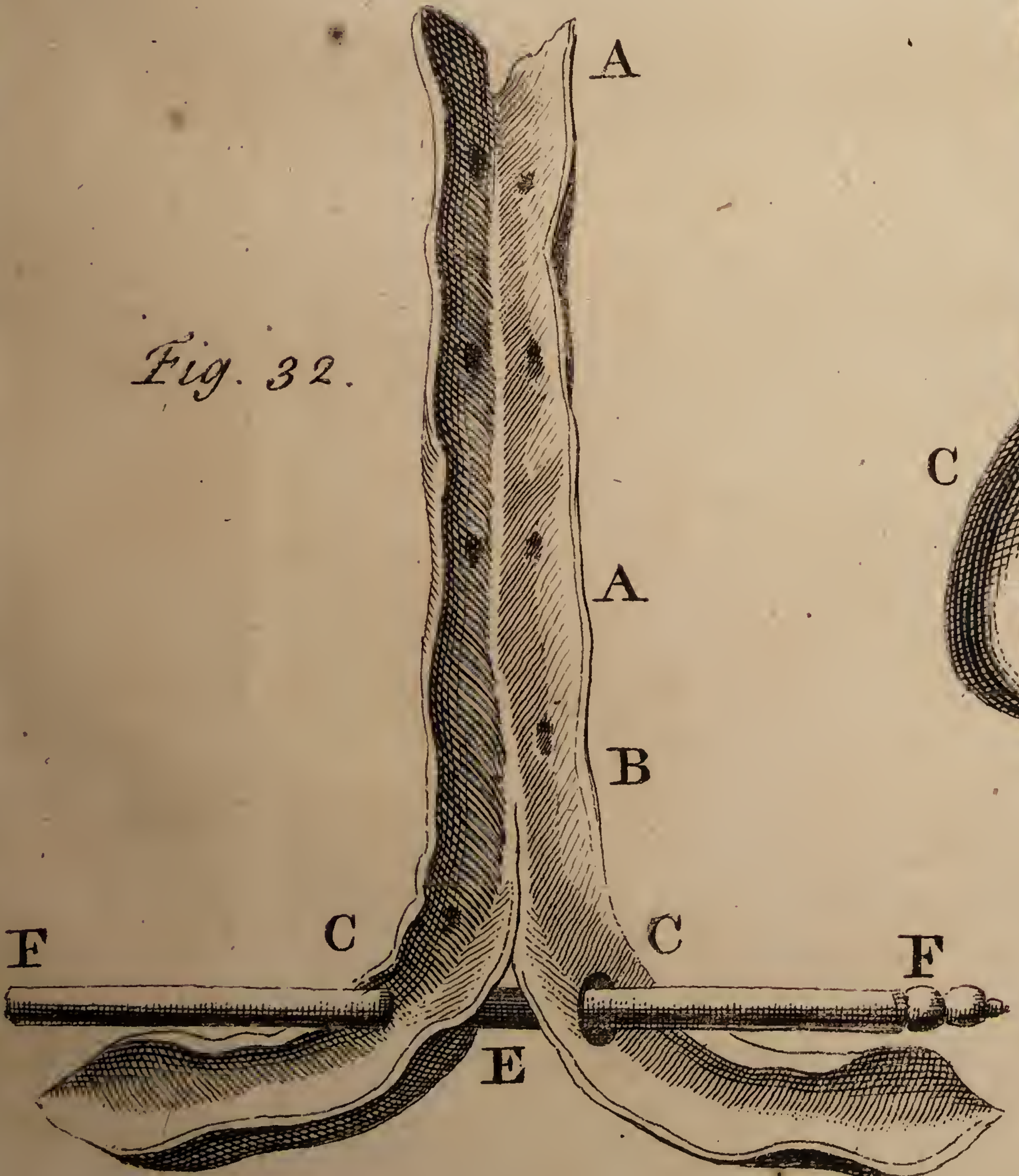
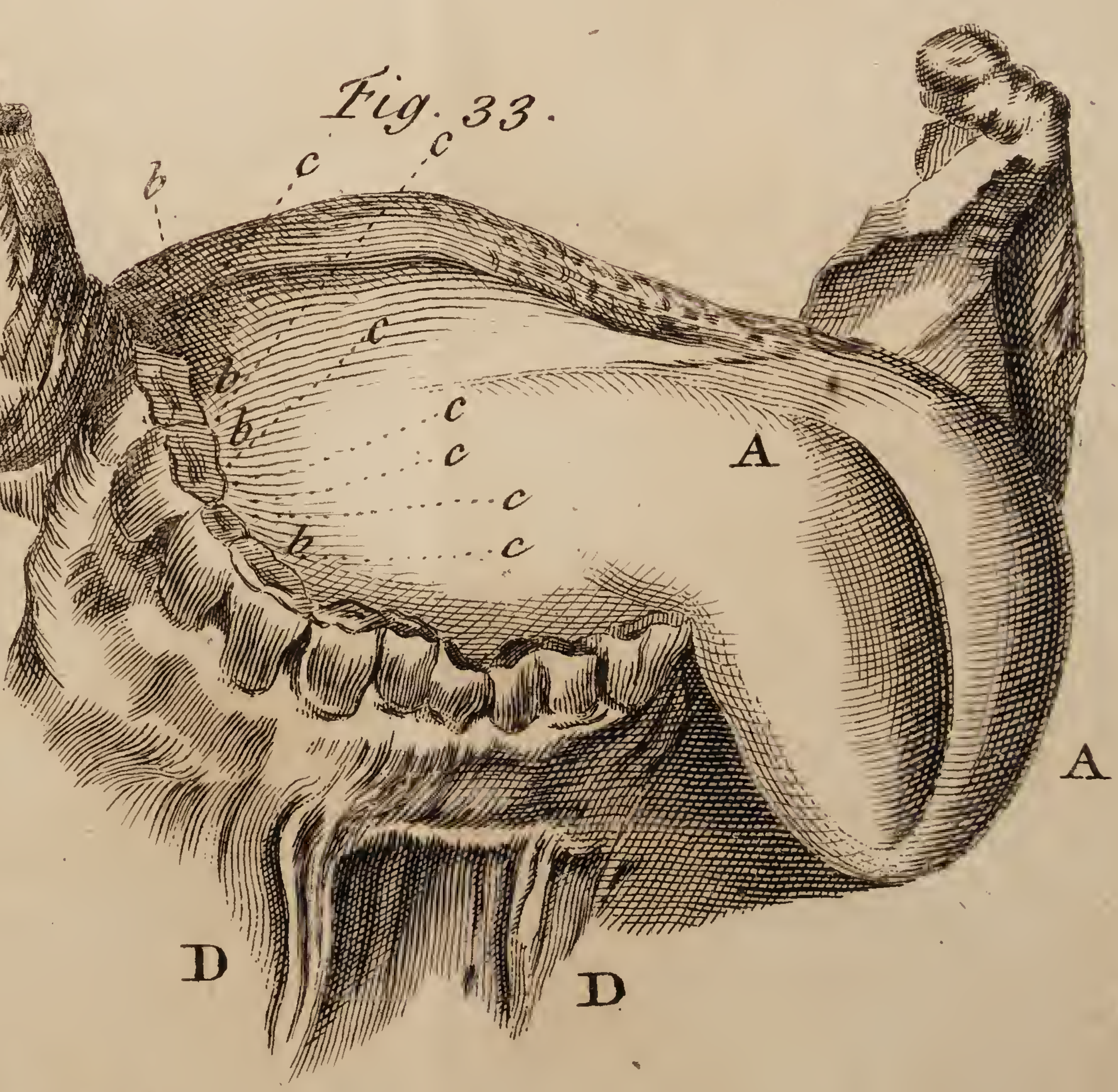


Fig. 33.



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E, The tranſverſe ſinus, which made a communication between the two lateral ones.

F F, A thick ſtyle, which paſſed eaſily thro' this tranſverſe ſinus.

The opening of this tranſverſe ſinus was ſmaller on the left ſide than on the right.

Fig. 33. Exhibits a view of the tongue, with the lower jaw, to which it adheres. We ſee in this the oſcula of the ſalival ducts of the ſublingual gland, as they appeared in the ſubject, mentioned S. 278, of this Compendium.

A A, The tongue, turned to the left ſide.

b b b, The oſcula of the ducts of the ſublingual gland, ſeven of which appeared on this ſide.

c c c, Briſtles introduced into the oſcula of theſe parts.

D D, The two elevator muſcles of the lower lip.

The firſt or anterior of theſe oſcula in the left ſide of the tongue in this ſubject was ſo large, that not only a briſtle, but a ſmall tube, was introduced into it, and an inflation might be made by it. The other oſcula in general were ſmaller, eſpecially two or three of them.

Explanation of the Eighth Plate.

Fig. 34. Exhibits a human tongue, in which two remarkable ſalival ducts were diſcovered in the foramen, commonly called cœcum, from its ſuppoſed cloſing at the end.

A, The foramen cœcum, which, in the ſubject examined on this occaſion, was remarkably large, opened.

b, A ſalival duct, running towards the root of the tongue, filled with a red injection.

c c, A veſicle at the extremity of this duct, diſtended with ſaliva.

d, The beginning of another duct in the left ſide. This was not filled by the injection; but it was eaſily diſtinguiſhed, as a duct, from the reſt of the ſubſtance of the tongue by its whitiſh colour; and it was capable of being diſtended by inflation, by means of a fine tube introduced into its orifice.

e, The place where this duct diſappeared.

ff, The ſituation and courſe of theſe ducts: it is obſervable that they do not run along the ſurface of the tongue, but at the depth of a line under the involucra of it, which are removed in this figure.

The fabrick and ſtructure of the oſcula, expreſſed at *b* and *d*, was ſingular: they had the appearance of valves, or caruncles, which had collapſed; and did not appear as repreſented in the figure, unleſs forced open by inflation.

g g, Shew three other oſcula, or foraminula, which were ſituated in the larger; one in the anterior part, and one on the right; the other on the left ſide. Theſe admitted a briſtle to a little depth, in an oblique direction; but it was impoſſible to find whether their cavity penetrated any farther. From this it appears, that this foramen, in ſubjects that have it, (for it is not univerſal) ſerves as a kind of common duct to various other ſmaller ſalival ducts of that part of the tongue: but, in all this, nature is by no means conſtant, but varies greatly.

h, The epiglottis.

i, Its anterior ligament.

k, Muſcular fibres ariſing from the ſubſtance of the tongue, and inſerted into this ligament, as if into a tendon. Theſe, when they are found, (for all ſubjects have them not) ſerve for the raiſing the epiglottis, and may be underſtood to be properly a muſcle of the epiglottis, and called gloſſo-epiglottideus.

l l, Two little oſſicles of the os hyoides.

m m, The extremities of the horns of the os hyoides.

n n, Glands and papillæ of various ſhape, viſible on the ſurface of the tongue about its middle.

o, The apex of the tongue, bent downwards.

Fig. 35. Exhibits the ducts beforementioned, as taken out of the tongue, with the foramen cœcum, which, in this figure, is not diſſected, but appears as a common duct to ſeveral ſmaller ones.

A, The foramen cœcum, very large, as it appeared in this ſubject, with the canal formed by it, which was near three lines long, and eaſily admitted a tolerably large tube.

B B, The two new ſalival ducts terminating in it, of the ſhape and ſize they appeared in this ſubject.

C C, The termination of theſe ducts, or, at leaſt, the place beyond which they did not appear to run.

D, The place where the left duct became expanded into a pellucid veſicle, which was filled with a clear and colourleſs, but ſomewhat viſcid fluid, having the appearance of ſaliva, and which ſeemed to have been forced thither by the throwing in the matter of the injection, which was of coloured wax.

Fig. 36. Exhibits ſeveral things that are obſervable in the palate, about the palate, and in the upper lip.

a a, The upper part of the palate, in which there appeared in this part no oſcula or openings.

b b, The poſterior part of the palate, very glandulous: in this part there appeared, in this ſubject, a great number of excretory oſcula, or apertures, very manifeſt and obvious. Some of theſe readily admitted a fine ſtyle, many of them a briſtle, to the depth of three or four lines; but this not in a ſtrait direction, but ſomewhat obliquely toward the hinder part. Theſe ſeldom appear ſo large as they did in the ſubject from which theſe drawings were made.

c, The place which correſponds to the canals, that Steno ſays are conſpicuous in the oſſeous part, behind the dentes inciſores, and run to the noſe: but in this ſubject, tho' all the other parts in queſtion were ſo remarkably large and fair, there was here no aperture, nor the veſtige of any paſſage into the noſtrils.

D D D, The upper lip bent back, that the interior parts may appear.

d d d d, Its lenticular or miliary glands, as they appeared in this ſubject, on removing the internal membrane of the mouth, extending themſelves on each ſide as far as to the ſecond of the dentes molares.

e, The ligament of the upper lip.

f f, Two conglomerate glands, obſerved in this ſubject, with certain excretory ducts, not deſcribed by any of the former anatomical writers.

g g, Briſtles and ſtyles let into theſe oſcula, or apertures, to the depth of about two lines.

i, A part of this gland, where there appeared two large oſcula, or apertures, which, on preſſure, diſcharged ſome drops of ſaliva, in the manner of dew-drops.

Fig. 37. Exhibits the left of theſe two glands: its exterior ſurface is repreſented here, by which it is evidently ſeen to be of the conglomerate kind.

Fig. 38. Repreſents ſeveral things about the fauces and uvula, viſible in the head and the upper jaw, viewed from below.

a, The duct in the fornix, or upper part of the fauces, ſituated under the anterior proceſs of the os occipitis; and deſcribed in its place, in this work, as a mucous duct.

b, Its extent under the apophyſis of the os occipitis, toward the great foramen, which is at leaſt five lines in length.

c, The left Euſtachian tube, with its oblique longitudinal aperture, and the cartilaginous limb ſurrounding it, as they appear, if viewed a little obliquely from the oppoſite ſide.

d, The right Euſtachian tube, as it appears on the ſame view, in which we cannot look into its orifice, but can only ſee the poſterior or exterior verge or limb.

e e, The oblique progreſs of both theſe tubes, as they run toward the ears.

f, A little hook, drawing off the muſcle which lies upon the tube ſideways; by which means the Euſtachian tube of that ſide is brought much better into ſight than it would be.

g g, The muſculi ſalpingo-ſtaphylini, inſerted into the hinder part of uvula, and ſerving to draw it back.

h h, The muſculi pterygo-ſtaphylini, which are turned back over the corniculus, or ſtyloide apophyſis of the interior lamina of the pterygoide proceſs, as if over a pulley, and inſerted into the anterior part of the velum palatinum. Morgagni denies that theſe are properly muſcles of the uvula, becauſe, he ſays, their tendons are affixed to the extreme verge of the bone of the palate: but a cloſe inſpection ſhews, that they are indeed partly affixed to this bone, but in part alſo to the velum of the palate.

i i, The fine and ſlender apophyſes in the pterygodei, which Santorini has very properly diſtinguiſhed by the name of cornicula, or little horns.

k, The uvula, bent back to the palate: in its middle, the glandulous membrane of the palate being ſeparated, there appears the muſcle called by Morgagni azygos uvulæ, as it appeared in this ſubject.

l l, The muſcle of the uvula, called the cerato-ſtaphylinus, lightly touched.

m m, The two poſterior apertures of the noſtrils, with the manner in which they open into the fauces.

n, The poſterior part of the ſeptum naſi, made by the vomer.

o o, The two heads of the occipital bone, which are articulated with the upper vertebra.

p, The foramen magnum, or great aperture of the occiput.

q q, The ears, appearing in ſome degree in this view.

The other parts, not immediately the ſubject of this diſquiſition, it is unneceſſary to mark out.

Fig. 39. Exhibits the os vomeris, or vomer, which Santorini does not allow to be a diſtinct bone, but only a part of the os ethmoides: it is exhibited ſingly and diſtinct here, as it was taken from a ſubject of about thirteen years old. In this ſubject it was perfectly diſtinct and ſeparate from the ethmoides; but it is to be obſerved, that in adults it concretes, and grows one bone with it.

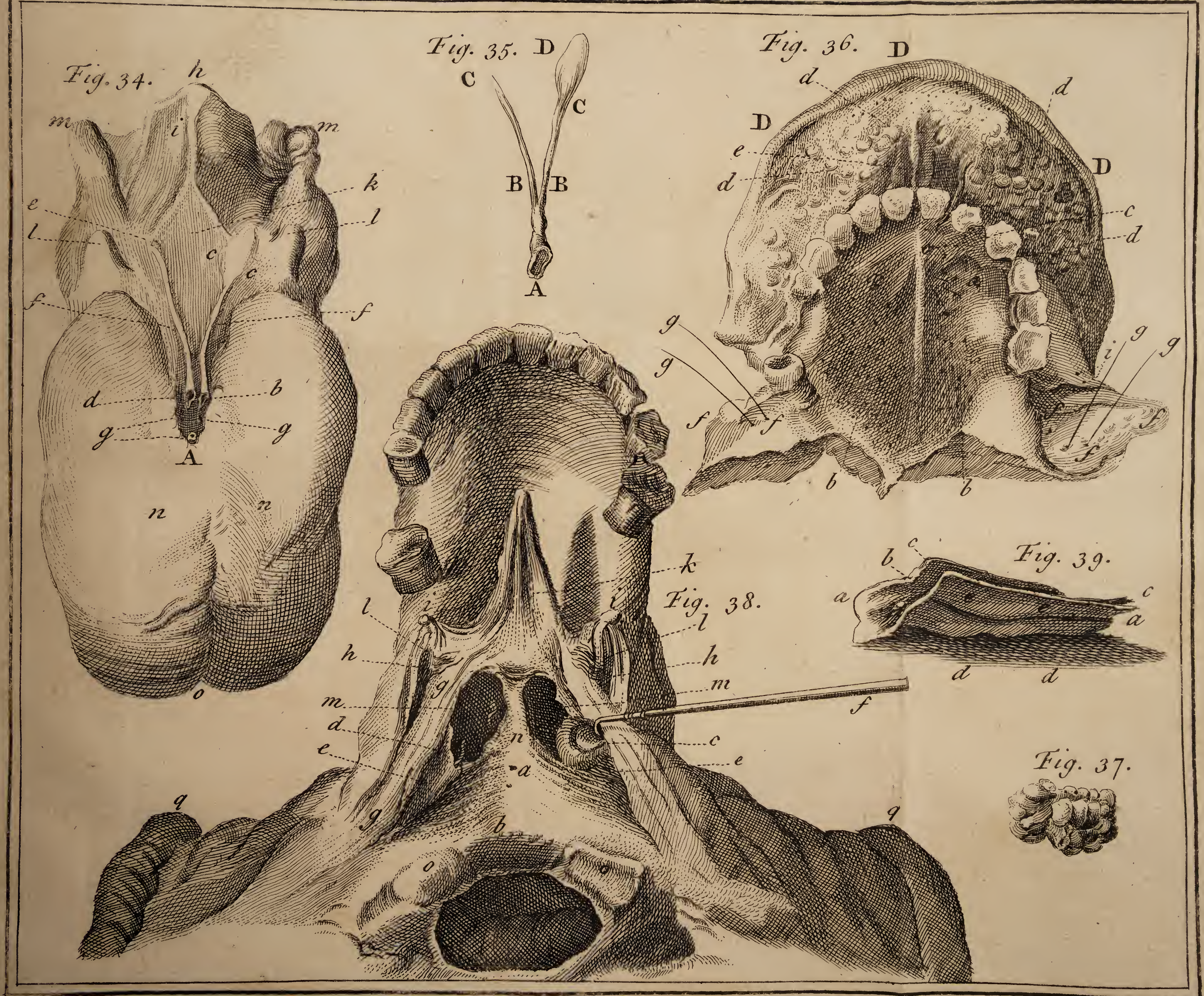
a a, The vomer, conſiſting of two diſtinct lamellæ, or boney parietes.

b, The hollow, which receives the apophyſis of the ſphenoidal bone by gomphoſis, with its edges reclined. This receives the apophyſis juſt mentioned, as the alveoli of the jaws do the teeth; whence theſe two bones are very properly ſaid to be joined by gomphoſis.

c c, An interſtice in its whole upper ſurface, between the two lamellæ; into which is inſerted part of the ſeptum naſi, which ariſes from the os ethmoides.

d d, The lower part, which is made with an edge, in the manner of a plough-ſhare: this adheres to the bones of the palate, where they join one another.

e e, The right lamella, or paries of the vomer; to which the left lamella is placed oppoſite, in the other ſide.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